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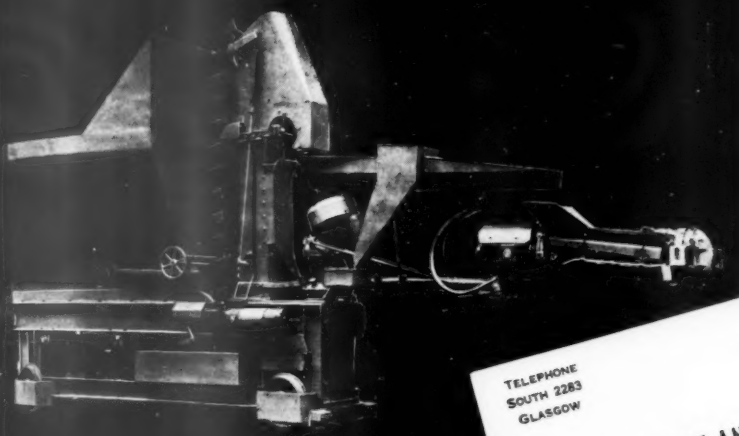

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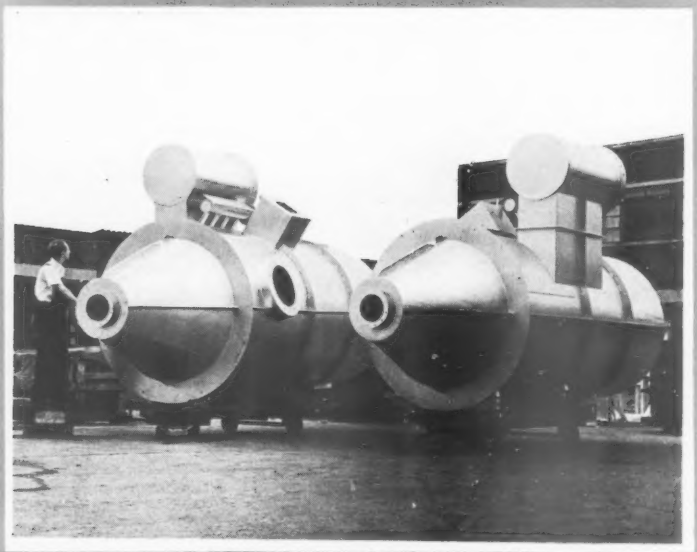

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The Base of a Pyramid

"Technical Education," a Report* presented to Parliament, opens with a quotation from the Bradford speech made by the Prime Minister, which terminated with the phrase ". . . we shall need many more scientists, engineers and technicians. I am determined that this shortage shall be made good." This Report emphasizes that the training given is to be on a broad basis, which is commendable, for, as stated on previous occasions, if education is a broad-enough-based pyramid, the top can look after itself. With the rapid changes in industrial techniques, the manufacturing personnel must above all be adaptable. The dictionary definitions of technologists and technicians have been sensibly simplified by explanatory statements and now read: "A technologist has the qualifications and experience required for membership of a professional institution. Most university graduates in engineering and other applied sciences and a good proportion of holders of Higher National Diplomas become technologists." "A technician is qualified by specialist technical education and practical training to work under the general direction of a technologist. Consequently he will require a good knowledge of mathematics and science related to his own speciality. Examples of technicians in the factory are assistant designers and the junior ranks of management on the shop floor."

The plan outlined in the Report envisages a largely increased number of local technical colleges and central institutions training a much greater number of students annually to the standards of technologists, technicians and craftsmen. The extent of this advance can be realized from the statement that, so far as England and Wales are concerned, it is proposed to raise the capacity of advanced courses on technology as soon as possible from 9,500 to about 15,000. To prepare students so that they may benefit from these advanced studies, the whole basic structure of technical education is to be materially broadened. Indeed the breadth is such that it is now envisaged to include girls in the scheme of technical education especially in the technician class.

The best feature of this Report is the "evolution" and not "revolution" of the British system of education. The rôle of technical institutes is recognized by the definitions of grades of the people conducting the manufacturing side of industry. Incidentally, the word "technologist" should in future make a satisfactory translation of the continental expression "*ingènieur.*" The new development should have the whole-hearted approbation of the foundry industry, the future of which depends entirely on an adequate supply of properly-trained technologists, technicians and craftsmen.

*Obtainable from H.M. Stationery Office, York House, Kingsway, London, W.C.2; price 1s. 6d. net.

IBF Cardiff Conference Fund

The Council of the Institute of British Foundrymen acknowledges with appreciation the following subscriptions received for the special fund which is being raised in connection with the conference which is to be held in Cardiff in June. It should be noted that Mr. R. J. Richardson, of Brown, Lenox & Company, Limited, Pontypridd, Glamorgan, is the hon. treasurer of the conference fund and he will be very pleased to receive subscriptions:—

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Film Review

None to Trouble Nobody : 35 or 16 mm.; running time 15 min. approx. Available to local authorities and organizations interested in the welfare of old people on application to Allied Ironfounders Limited, 28, Brook Street, London, W.1.

As a further contribution towards the solution of Britain's housing problem, Allied Ironfounders Limited have produced their third film, carrying the above caption. It first covers the efforts made by local authorities and charitable organizations, but the main theme is the effort made by the Women's Voluntary Service to provide homes for women old-age pensioners. This is done by buying houses too large for most modern householders but too small for use by public authorities. After modernization involving the construction of communal kitchens, bathrooms, and toilets, they are let off by rooms to women pensioners at a rental of the order of 10s. to 15s. 6d. a week. The people bring their own furniture—a factor converting a room into a home. The problem of catering for this class of the community is becoming ever more insistent as the present number of 7,000,000 old-age pensioners will become 12 million in 1970. It is not an advertising film, but of course, any widespread development of the scheme envisaged would benefit foundries making heating and cooking apparatus and baths.

The Duke Makes a Casting

The most distinguished Honorary Member of the Institute of British Foundrymen, H.R.H. the Duke of Edinburgh, when visiting Nigeria with H.M. the Queen, toured the workshops of the Nigerian Railway at Lagos on January 31, and during the tour poured molten metal into a mould to cast a plaque commemorating his visit. So far as is known, this is the Duke's first experience as a "practical foundryman" since his election to the Institute. Mr. James Fraser, a member of the Scottish branch, who is at present in the employ of the Nigerian Railway, was in charge of the arrangements. Readers will be interested to learn that a report has been received from Mr. Fraser that the casting was a good one.

H.R.H. The Duke of Edinburgh pouring the casting.

Recent Dinners

During the past few weeks several dinners have been held, including that of Aga Heat, Limited, in connection with the annual conference of their agents. It was held at the Dorchester Hotel and presided over by Mr. V. Jobson. The South of England Ironfounders' Association held their spring dinner at the Tallow Chandlers Hall at which Mr. W. T. Hobkirk presided and Sir George Barnett was the principal guest. The Machine Tool Trades Association entertained the Press at the Savoy Hotel; Mr. H. P. Potts presided. The annual dinner of the Foundry Coke Merchants' Association was held at the May Fair Hotel, London, with Mr. R. J. McDonald, M.INST.F., the chairman, in the Chair.

Ideal Home Exhibition

The Ideal Home Exhibition held from March 6 to 31 at Olympia, London, opened to the public in a blaze of publicity and was again an excellent example of showmanship at its best. All the large manufacturers of heating and cooking appliances took space in the most prominent positions in the Grand Hall. They are putting up a good fight to sell their desirable and useful appliances in competition with television, motor cars and other goods sold on the deferred-payment system. It was pleasing to note that "foundry" manufacturers are giving increasing attention to bottled-gas-fired apparatus, for herein is a major field for increasing exports.

Is Green-sand Moulding Deteriorating?*

By Harold Haynes

The Author takes a serious view both of the lack of new entrants into the foundry industry and the falling off in craftsmanship which results in fewer castings of fair size being produced from green-sand moulds. In this Paper, the making of several large castings in green-sand is described, to show just what is possible from the method when intelligently handled. Higher productivity for jobs weighing up to 18 tons is amongst the claims well substantiated by the Author. He deals in turn with the making of a housing-bed; a large box for a moulding-pit, built up from open-sand-cast plates; a bedded-in fly-wheel, half-flywheel and a horizontal-engine bed.

At the same meeting of the Institute as that at which Mr. Haynes' contribution was presented, a second Paper, "Aspects of High-duty Cast Iron" was given by Mr. C. R. van der Ben, a colleague of Mr. Haynes and chief metallurgist at the same firm—National Gas & Oil Engine Company, Limited. The two Papers were discussed jointly after presentation and the salient features which emerged during this discussion are included in what follows:

MR. H. HAYNES is foundry manager at the National Gas & Oil Engine Company, Limited, and a past-president of the Lancashire branch of the Institute of British Foundrymen. He served his apprenticeship at Moorhouse's Brass Foundry, Stalybridge, and at the works of Scott & Hodgson, Guide Bridge, joining his present company in 1918. In 1939 he was appointed foreman and in 1943 foundry manager. From his own pen and in association with his colleague Mr. C. R. van der Ben (on the metallurgical side) he has presented several papers, being awarded the Meritorious Services Medal in 1953.

HOUSING-BED CASTING

The first job to be described is the making of an 18-ton cast-iron housing-bed in a green-sand mould and the tackle required for its production. First, when embarking on such a job it is essential to picture what is required—seeing the job "cast," as it were. One must visualize the weight of metal required; the strain and stress on various parts of the mould; the lifting pressure; the size, positions and number of runners and risers required; the kind of facing sand to use; the time taken to pour, and so on. The housing-bed referred to is 30-ft. long by 4-ft. wide at the top, 2-ft. deep, and having six T-head cores each 5-ft. long and 23-in. deep (including 3-in. of print) running the length of the mould. The thickness of metal over the cores and on the sides is 6 in.

Allowance for Lift

The lift under the top-part of the mould, caused by the entry into the mould of molten metal under pressure, is a very important factor and one must prepare to work "safe" when making such a large casting. As a guide, the area of the top-part is ascertained and multiplied by the height of the pouring basin (20-in. deep) to give the weight required by calculation, including the weight of the casting (18 tons), that is 360 × 48 × 20 × 0.263 lb.

There are other factors which have to be considered beside the simple laws which govern the "lift." For instance, there is also a good deal of pressure due to momentum of the metal poured directly into the mould, which will cause "straining" of sections of the mould. Rapid pouring will cause more momentum and straining than slow pouring. The correct positioning of risers can also do much to relieve this effect. The position of weights on the mould can also have an influence on the effect of lift, and if calculation alone is used, there could be trouble, but most moulders also bring past experience to bear. It may surprise many that the lift on the job to be described is approximately equivalent to 60 tons. A certain way to ensure that there is no lifting of the top-part is to use bolting-down tackle which is both safer and quicker; by this method there is no need to use weights. Here again, in the design and making of bolting-down tackle, the experience and craftsmanship of the moulder are of the utmost importance, for even at this early stage he must be able to visualize what might happen at any subsequent operation. All his craft is needed to mark out and make all the necessary tackle in open sand in the foundry floor. The making of a small plate in this way is quite simple, providing it is not heavy, but when large ones are made, the texture of the sand must be correct—hard enough to stand the flow of metal when casting—and great care must be taken to ensure a level bed or the plate will not be of even thickness.

* Paper presented originally to the Lancashire branch of The Institute of British Foundrymen, and since given to several other branches.

Is Green-sand Moulding Deteriorating?

Moulding Tackle

The pattern for the housing-bed, shown in Fig. 1, is first inspected by the moulder, and he must then visualize the way in which he intends to make the job and what tackle will be required, after receiving instruction from his manager about the particular requirements. Fig. 2 shows a plan and elevation of the tackle required to produce the

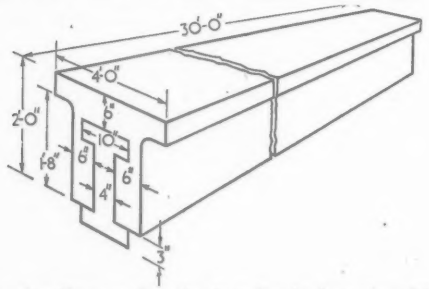


FIG. 1.—*Pattern for the housing-bed casting, 30-ft. long and carrying a T-shape core running the full length.*

housing-bed. The plan shows the closed mould covered by three top-plates, which are held down by nine bearers bolted into position to floor girders which are permanently set in the moulding pit. The lower portion of Fig. 2 shows an elevation sketch of the top-plates, floor girders, runner basins and ingate system, also the riser-bushes.

The first items to be made are the nine floor girders (Fig. 3) which are U-shaped, 7-ft. wide, 3-ft. deep and of 6-in. square section, tapering to 8 by 8 in. at the top of each leg of the U, to accommodate the T-head slots. The pattern for the floor-girder is also used to make the top-girder castings, by removing the two legs of the U. The top girders are thickened up to 8-in. deep and also have two oval slots cast in to take a bar of metal through the centre of each slot for lifting by crane. It will also be noted that when not in use, the girders can be

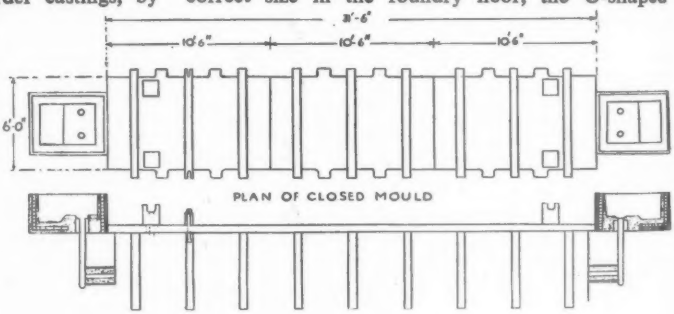


FIG. 2.—*Plan and elevation sketches indicating the moulding tackle required for the housing-bed.*

piled neatly on top of each other, making a compact and safe stacking arrangement as there are no staples protruding. Fig. 4 shows an isometric sketch of the housing-bed casting, with three floor girders in their relative positions.

Top Plates

Fig. 5 shows a portion of one of the three top-plates which are each 10-ft. 6-in. long by 6-ft. wide, and it can be observed that at each side of the 3-in. thick plate there is a flange which serves as a straight edge and is machined along its entire length; these flanges project 2 in. "Prods" are cast over the surface of the plate to hold the loam which forms the top of the mould. Equally-spaced lugs are also cast on each side of these plates for lifting and turning over. The prods are 1½-in. long and the plates are rammed with a ganister/loam mixture, with hard furnace coke bedded-in between the prods. The mould for the plate is then dried and finally skimmed up with ½-in. thickness of loam. An important feature of these plates is ease of renewal for the next cast. After a housing-bed casting has been poured, the plates are lifted off, turned over, and the ½-in. of loam scraped off, whilst the plates are still hot. The loam is then renewed and strickled off and dries itself out without stoving. The plates are stacked on the top of each other, with spacers between, so as to save floor-space.

The same illustration also shows how the flanges on the top-plates are positioned on the top of each leg of the floor girders and here will be seen the reason for having the T-head slots clear of the flange on the top-plate, this being accompanied by tapering of the top of each leg of the floor girder to 8-in. square. Furthermore, this view shows two riser-bushes in position; these must be arranged to clear the top-girders when they are bolted in position for casting. There are two risers in each plate connected to spray-risers on the joint of the mould. The riser-bushes are 10 by 10 by 12-in. deep, with a cut-out at one side which serves to run-off the metal when it reaches a depth of 4 in. in the riser; this also drains the two runner basins at each end of the mould.

Mould Assembly

Fig. 6 shows a section of the mould which is assembled as follows:—The pit having been dug to correct size in the foundry floor, the U-shaped floor girders are accurately positioned in it and six straight-edges (each 10-ft. 6-in. long with feet cast on, as shown in Fig. 6) are permanently set in position on bricks, inside the floor girders. These straight edges are set with ⅜-in. camber. It will be clear that a bed can soon be renewed after casting, as the straight edges do not need "re-setting" each time. Great care must be taken when lifting the

casting from the floor so that the straight edges are not disturbed. Also, before the first bed is strickled off, a permanent cinder-bed is made under the pattern. After strickling-off the bed. two boards are laid along the face of the bed in correct positions and the core print for the T-head cores is strickled out of the bed.

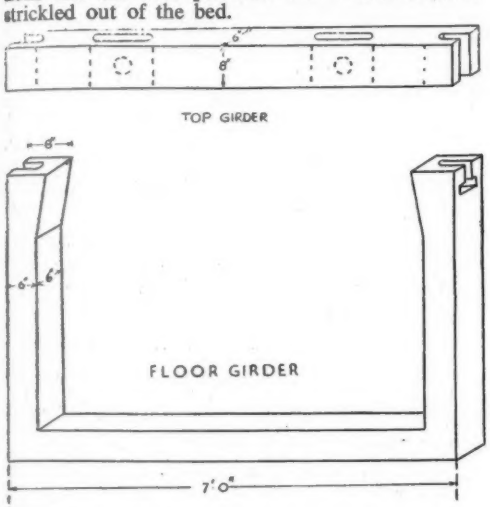


FIG. 3.—*Sketch of a floor girder and top girder, nine sets of which were required.*

The facing-sand mixture used for the mould is as follows:—four barrowfuls of foundry floor (black) sand, two of Manchester red sand, one riddle of road sand, two riddles of dried horse-manure, 1½ buckets of coal-dust and half a bucketful of sieved lime. This mixture is used for the face next to the pattern as ramming proceeds and when moulding reaches the radius under the top flange a layer of ashes is incorporated to provide extra venting necessary to prevent scabbing of the mould at this point. There are six risers on the job, connected to sprays on the mould joint. The runners consist of 2-in. dia. ingates of which there are two at each end of the mould. The running time for this casting is approximately 1 min. 40 sec.

Runner Boxes

The runner-boxes, Fig. 7, are made from five open-sand-cast plates bolted together, *i.e.* four sides and a bottom. The outside dimensions are 4-ft. 6-in. long by 3-ft. wide by 20-in. deep. The sides are bricked with a single course and faced with loam. The runner-core, which embodies a recess for the stopper, is bedded in position in the runner-box, and is 6-in. square by 3-in. thick. The ingates are rammed up in steel tubes 5-in. dia. by 18-in. long; this ensures maximum safety during casting. The down-gates, too, are rammed-up in tubes for the same reason. The runner basins are drained, on casting, by the cut-out risers, so that only the metal actually in the dropping basin has to be removed as a "head" after the casting has solidified. The layer of loam inside each runner-box is soon renewed, and the runner-box is then ready for use once more.

"T" Cores

The main T-head cores, 10-in. wide and each 5-ft. long, are made with a large print along the bottom, which serves to locate the core in the

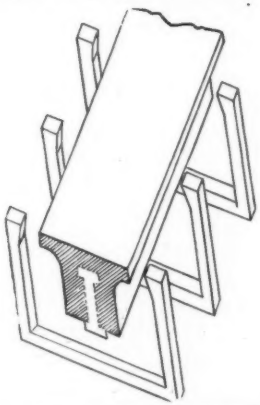


FIG. 4.—*Isometric sketch of the housing-bed showing the relative positions of the floor girders (three only being shown).*

mould and also serves as a base for the core to balance on until it is dried. The corebox is made as shown in Fig. 8 and the cores are rammed up in this position so that when the two halves of the box are withdrawn, the core is left on the plate

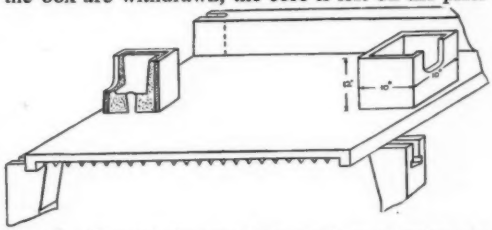


FIG. 5.—*One of the top-plate castings showing the side flanges, "prods," and riser-bushes*

ready for removal to the core-stoves for drying.

Production

Some production details may be of interest: Forty of these castings were required in 24 weeks, and four men and a boy were employed to do this at the rate of two castings per week. Due to the long cooling times required for an 18-ton casting, three pits were used, *i.e.* three sets of floor girders were needed, but only one set of top-plates, top girders, and runner-boxes, etc. All these castings were successfully made in green-sand moulds (with the exception, of course, of the loam top-plates).

Is Green-sand Moulding Deteriorating?

MOULDING-PIT BOX

The second large project to be described is the making of a moulding-pit box built up from open-sand-cast plates. The box, shown in Fig. 9, is 20-ft. long by 8-ft. wide by 9-ft. deep. Each side

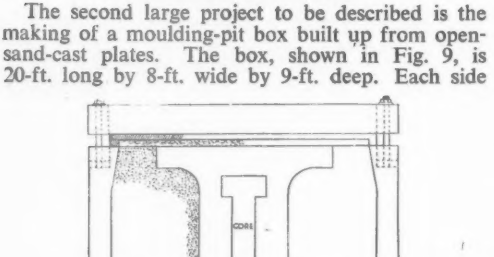


FIG. 6.—*Section through the mould assembly for the housing-bed, and one of the straight-edge castings.*

is made from four plates, 10-ft. long by 4-ft. 6-in. wide, and the ends are made from two plates, each 8-ft. long by 4-ft. 6-in. wide. These plates, which are ribbed for strength under the T slots,

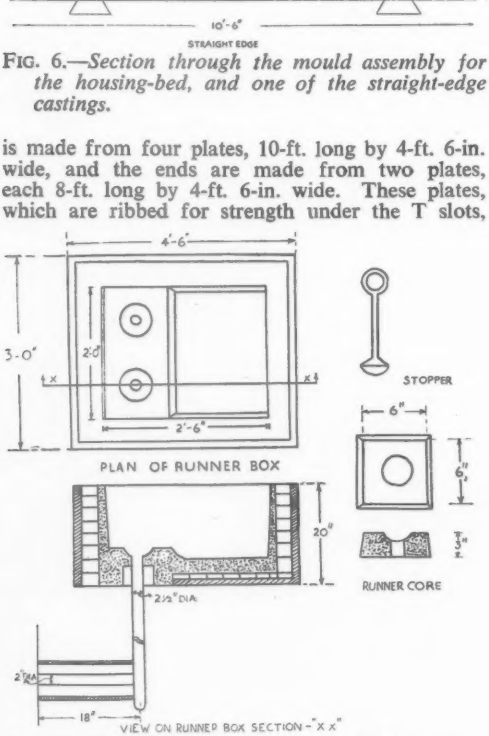


FIG. 7.—*Plan and elevation sketches of the runner-box, running system and its components.*

are made in open-sand moulds on the foundry floor. The job is not quite as simple as it may seem at first sight, for if they are to be free from scabs, swells and blowholes, the texture and ramming of the sand must be correct and here again is where the craftsmanship of the moulder is put to the test. The T slots must also be true to size and position as also must the many holes which are cast in each plate, for all must bolt together without machining.

A most interesting point about these plates (Fig. 9 (*a*) is that each bolting hole has at each end a semi-circular recess, and when bolts are inserted a cup-shaped cast-iron washer at each end of the bolt beds itself into the recess, so forming a "knuckle" joint for the bolts which makes them self-positioning when the nuts are tightened, and, once tightened, they will not slip out of position. This notion of using a cup-shaped cast-iron washer, which beds itself into a recess in a plate, is also applied to the bolting together of the sides of box-parts used on jolt-ramming moulding machines. Such a fastening successfully withstands the jolting and vibration which the boxes are subjected to and yet maintains the relative positions of the plates forming the box.

BEDDING-IN A FLYWHEEL

The flywheel shown in Fig. 10 is 8-ft. dia. The depth of the wheel is 1 ft. and the boss has a diameter of 17½ in.—with an 8-in. dia. hole; the weight of the wheel is 4 tons and it is produced by the bedding-in method. The operations required to make this wheel casting in a green-sand mould are very simple, yet in their practical details they call for the exercise of much skill on the part of the moulder. The difficulty of bedding-in lies chiefly in obtaining the proper texture of the moulding sand; if the sand be of uneven consis-

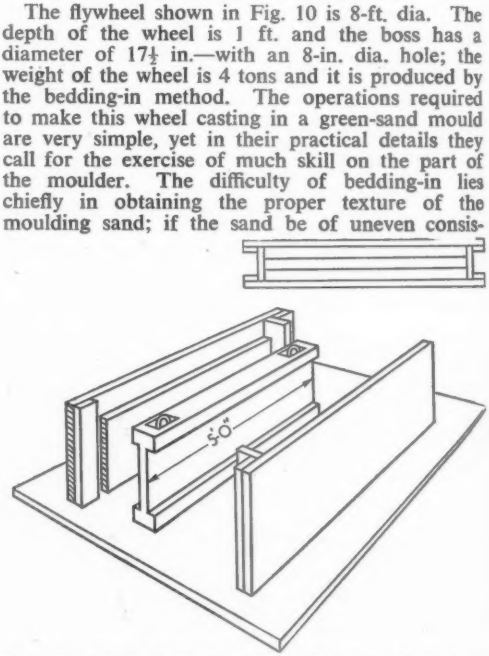


FIG. 8.—*Main T-shape core and the corebox from which it is made.*

tency then something is liable to go wrong, and here again what is known as the feel of the sand is of utmost importance, for avoiding uneven bedding and ramming and venting.

The main object in making this four-ton flywheel "green" instead of "dry" is, of course, to save expense, and especially to-day when increased prc

duction seems to be the "be-all" and "end-all," must such matters be well considered.

Production Stages

To give a step-by-step description of the method adopted: First the moulder digs a hole in the prepared sand bed 8-in. larger in diameter and 3-in. deeper than the pattern. Where, as in the Author's case, two men cast one wheel each day, three such holes are prepared in the foundry floor (so that two men need 20 tons of metal per week). The sand employed consists of 60 parts Manchester red sand, 40 parts floor sand with 10 parts coal-dust. It must not contain more than 5 per cent. moisture, but should be well mixed and put through a screen. When the pattern is withdrawn from the mould it is "finished" and rubbed over with dry plumbago. The running of the job is very important; the runner-box used is 5-ft. long by 22-in. wide by 10-in. deep. The downgates employed are two of 1-in. dia. on the boss of the wheel and one of 1½-in. dia. which is used for "feeding." The riser is located on the rim but is not "fed." On the contrary, soon after casting, water is poured on top of this riser to make it set quickly. The riser is "sealed" or covered during casting to prevent the top part from being "drawn in." After the riser is solidified, the 1½-in. dia. runner is used to feed the boss with the hot metal and this method prevents "pumping" in the mould. These wheels have to be clean castings and true to balance and are subjected to keen inspection. Their production as green-sand-moulded castings reflects great credit on the moulder concerned and especially when it is a fact that they are being almost "mass produced."

A similar job to the one just described is a "half"-flywheel also cast "green" (shown in Fig. 10), and a further example of green-sand-moulded work, is a horizontal-engine bed (Fig. 11) which is 9-ft. 3-in. long by 3-ft. 10-in. wide by 3-ft. 2½-in. deep and weighs about 3 tons.

Reverting to his original query: "Is green-sand moulding deteriorating?", the Author has tried to show that as long as jobs of the kind described are still being made in green-sand, there is still some

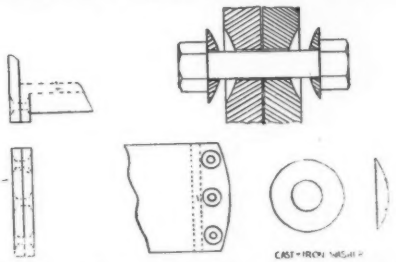
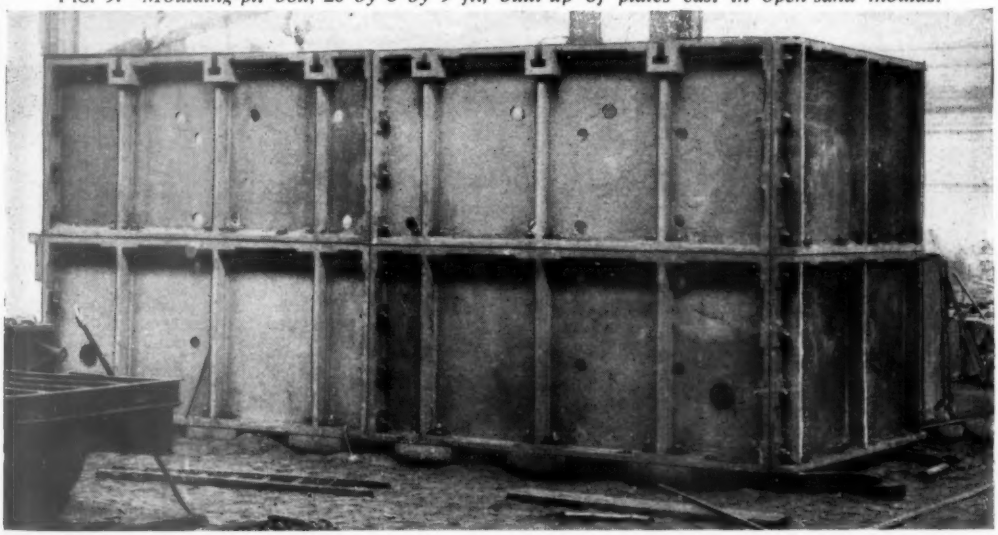


FIG. 9 (*a*).—*Fixing details for assembly of the moulding-pit castings.*

hope that the old foundry craftsmanship, which has for its base sound commonsense allied with a deft sense of "touch" and a love of accomplishment, is certainly not yet dead. It is hoped that these examples of green-sand moulding practice—together with many more which founders may recollect from personal experience where large castings are successfully being made in many foundries in green-sand—may effectively refute the enquiry as to whether green-sand moulding practice is losing ground.

FIG. 9.—*Moulding-pit box, 20 by 8 by 9 ft., built-up of plates cast in open-sand moulds.*



In conclusion, the Author expresses thanks to the National Gas & Oil Engine Company, Limited, for permission to use much of the material in this Paper, and also the foundry staff of the firm who have helped in its preparation.

DISCUSSION

(After Mr. Haynes' Paper had been presented, the meeting was opened for its discussion, jointly with that of his colleague, Mr. C. R. van der Ben, on high-duty cast iron, which had been given earlier the same evening.)

When a vote of thanks had been accorded to the Authors, on a proposal made by MR. AITKEN and seconded by MR. HOPWOOD, the discussion was initiated by the latter, who asked Mr. van der Ben if it was found necessary to use a large number of metal mixtures in the production of the castings described, because some metallurgists did not consider such a procedure essential. He also asked Mr. Haynes what benefit was to be derived from the introduction of lime into the sand.

MR. VAN DER BEN replied that metal mixtures were varied to give the properties needed in the many types of castings produced.

MR. HAYNES, replying to the second question, said it was usual to have lime additions in green-sand work of the type described.

MR. WALKER asked Mr. van der Ben to say what were the machinability characteristics of 20- to 23-tons tensile iron. He, personally, did not think green-sand moulding was deteriorating, except when jobbing work was concerned. With mechanized moulding, the position was not the same.

MR. VAN DER BEN said machinability did not present any difficulty; even material having an acicular-type of structure was reasonably machinable.

Less Skill Shown

MR. BURNS said a firm in Manchester was using cores every day weighing a ton each and these were never stove-dried.

MR. PROCTOR, referring to skill, considered it was deteriorating for two reasons: (1) That boys were not entering the foundry industry in sufficient numbers; and (2) that economic and managerial aspects had to be taken into account. A casting to-day cost more than three times what it did 20 years ago. Managers, therefore, when thinking about the possibility of scrap castings, turned to dry-sand moulding as an "insurance" much in the same way as Mr. Haynes in making the top-part of one of the moulds he described.

MR. HAYNES countered by saying that if he had made all that job in dry-sand, he could not have produced two castings per week.

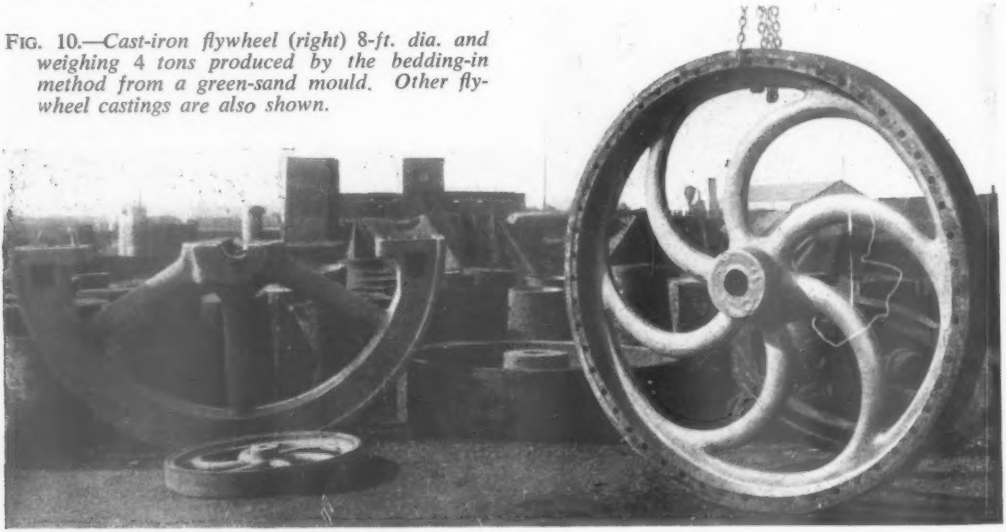
MR. HOPWOOD said an aspect which had not been mentioned was the improvement demanded in the properties of castings. Formerly, Scotch pig-iron and similar materials were used for large and important engineering castings, but nowadays the bulk of the irons were of the refined type. This change had a bearing on the deterioration in the use of green-sand moulding.

MR. HAYNES said his experience at the present time confirmed that generally speaking sand moulders, together with their craft and skill, were deteriorating. To meet world competition, this state of affairs must be changed, he thought.

Metal Mixtures

MR. VAN DER BEN said Mr. Hopwood when mentioning pig-iron changes had opened a big subject and one to which he had given a good deal of thought—both as it concerned ordinary iron mix-

FIG. 10.—*Cast-iron flywheel (right) 8-ft. dia. and weighing 4 tons produced by the bedding-in method from a green-sand mould. Other flywheel castings are also shown.*



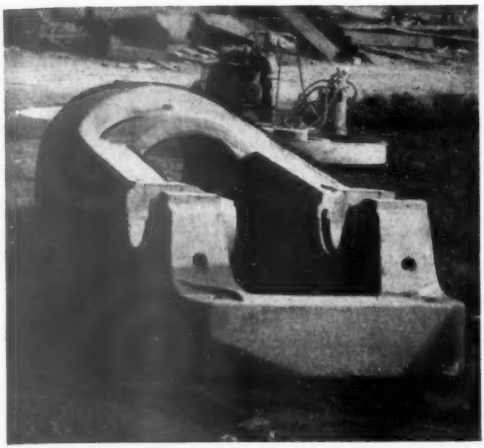


FIG. 11.—*Horizontal-engine bed casting weighing about 3 tons, also produced from a green-sand mould.*

tures and in relation to high-duty material. By alloy additions, a 14-tons tensile iron could be raised to 17-tons tensile but he would not like to carry it further than that.

MR. HAYNES stressed that one could make an iron to give 17 tons per sq. in. tensile without in any way interfering with its suitability for pouring into green-sand moulds.

MR. HOPWOOD asked whether it was in fact found in formulating a mixture of iron, to produce a particular composition in the casting, that one could get a different result by using different metallic constituents, although the composition was the same.

MR. VAN DER BEN agreed that this was so, but said there was a time when he would have doubted it.

A MEMBER, speaking about the incorporation of nickel, asked whether, if it was introduced into the cupola, there was the same even distribution as when it was added in the ladle?

MR. VAN DER BEN replied that as a cupola addition, some nickel might be lost if only a small amount of metal was required. Ladle additions were suitable for small quantities and for this purpose a nickel shot was used containing 4 to 5 per cent. of silicon, with the result that it could be readily absorbed by molten iron when tapped hot from the cupola.

BIM Droitwich Conference

Speaking on March 23 at the opening of a conference at Droitwich organized by the British Institute of Management with the theme "Industrial expansion in a period of full employment," Sir Graham Cunningham said that industry's contribution to the battle against inflation should be to hold its prices "by hook or by crook" even if that meant a reduction in profits. Sir Graham said he was not so convinced as some people that full employment would remain with us. He suggested that management should consult with the unions in an attempt to devise a scheme that would give some assurance of continued employment to men who might be threatened with redundancy. Industry had also to remove the workers' distrust of the economic system and prove conclusively that the expansion of production by the adoption of new methods would not throw people out of work. No legislation or Government action of itself could cure either unemployment or inflation brought about by full employment. Either disease could only be cured when there was the strong moral force of the majority of the people determined to effect a cure. Sir Graham criticized restrictive practices in the form of demarcation rivalry and resistance to mechanization.

Speaking at the second session of the conference, the following day, Mr. W. Douglas Seymour of Birmingham University's Department of Engineering Production, said that even in the highly-mechanized industry of to-day, the key to higher productivity still lay in the manual skill of the industrial worker. Mr. N. W. R. Mawle, stressing the need for manufacturers to study distribution costs, said recently there had been much criticism of the British approach to markets of the world. We must not allow our eagerness for great productivity and standardization, to outweigh our judgment, when considering the different markets' various requirements. People will have variety; freedom of choice is essential to maintaining a high standard of living.

Scottish Industrial Development

A new factory, where jigs, gauges, precision tools and parts for turbo-jet engines will be produced, is to be set up at Auchterarder, Perthshire, within the next two years. The company, a light engineering firm with headquarters in England, is at present building a factory at Hamilton, Lanarkshire, and when that is completed work will begin on the new one. Key personnel will be provided by the firm, but there will also be an apprenticeship scheme which, it was stated, will be a boon to the youth of the district. This will be the first of this particular type of engineering to be carried out in Scotland and when the two factories are in full production it is estimated that about 1,000 workers will be employed.

In addition, Auchterarder will also have another industry of a smaller nature. A brickworks will be opened on ground at Waulfield, about a mile and a half from the town. Tests of the clay have been in progress for some years, and these have proved satisfactory. When the kilns are in full operation, work will be provided for between 30 and 40 men. Of the 23 American concerns which have established themselves in Scotland since the war, most have done so well that they have had to increase production and factory space. Burroughs Adding Machine Company, Limited, whose existing plant is on the Vale of Leven industrial estate, is planning to expand by five times its present size, with jobs for several hundred extra workers. Glasgow is a possible site for the expansion—probably within three years—because further extensions in the Leven estate do not seem possible. The Honeywell-Brown Company are planning to expand their business at Newhouse industrial estate. Meantime, work has started on the site of the new Caterpillar Tractor works at Tannochside, Lanarkshire.

Mr. R. A. HATFIELD, managing director of Burton Constructional Engineering Company, Limited, of Burton-on-Trent, died on April 5 at the age of 70.

G

Institute Elects New Members

At the Council meeting held at Manchester on January 21 this year, the following were admitted to membership of the Institute of British Foundrymen in the grades indicated below:

AS SUBSCRIBING FIRMS

Allied Ironfounders Pty. Limited, Clayton, Melbourne, Australia (Representative: G. E. Miller).
Head, Wrightson & Company, Limited, Teesdale Iron Works, Thornaby-on-Tees, Yorks (Representative: F. Shepherd).
Malayan Railway Administration, Railway and Post Operation, Kuala Lumpur, Malaya (Representative: J. F. Shippen).
Sklenar Furnaces, Limited, Cardiff (Representative: F. P. Golby).
S.S. Engineering & Foundry Pty., Limited, Rivervale, Western Australia (Representative: G. M. Brand).

AS MEMBERS

F. A. Blake, Charles Carr, Limited, Smethwick, Birmingham.
G. M. Brand, S.S. Engineering Foundry Pty., Limited.
K. W. Breeden, Morgan Crucible Company, Limited, London, S.W.11.
R. J. Brown, British Motor Corporation, Limited, Longbridge, Birmingham.
T. I. Dixon, Coleman-Wallwork Company, Limited, London, S.W.1.
W. H. Ferrie, Knete Castings, Limited, East Horndon, Essex.
F. P. Golby, Sklenar Furnaces, Limited, Cardiff.
A. E. Grocutt, Sheepbridge Engineering, Limited, Chesterfield, Derbys.
H. S. Hill, R. J. Hunt & Son, Limited, West Heath, Birmingham.
S. Hinde, Department of Technical Education, Sydney, Australia.
C. Hooley, Ransomes, Sims & Jefferies, Limited, Ipswich, Suffolk.
F. Howitt, Leopold Lazarus, Limited, Birmingham.
W. G. Humpheson, John Harper & Company, Limited, Willenhall, Staffs.
F. J. Jackaman, The Manganese Bronze & Brass Company, Limited, Ipswich.
S. C. W. Jenkins, B. Rhodes & Son, Limited, Romford, Essex.
T. Leatherbarrow, Neptune Brass & Aluminium Company, Limited, Treforest, Glam.
M. C. E. Mair, Samuel Jones & Company (Engineering), Limited, London, S.E.15.
J. MacKintosh, The Falkirk Iron Company, Limited, Falkirk, Stirlingshire.
G. E. Miller, Allied Ironfounders Pty., Limited.
G. S. Montague, Montague & Toll, Burnham, Bucks.
S. A. B. Muirhead, Alfred Herbert, Limited, Coventry.
A. Petit, Shaw Glasgow, Limited, Glasgow, N.W.
L. J. Richards, John Harper & Company, Limited.
W. Street, Neptune Brass & Aluminium Company, Limited.
H. Strong, J. W. Jackman & Company, Limited, Manchester.
L. E. Turner, Bonnington Castings, Limited, Leith, Edinburgh.
H. Wood, Shire's, Limited, Guiseley, Yorks.

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A. C. Brearley, Catton & Company, Limited, Leeds.
L. Clarke, John Harper & Company, Limited.
R. Dawson, Renfrewshire Education Committee, Paisley, Glasgow.
A. Jamieson, Canada Iron Foundries, Limited.
H. Wilton, Warner & Company, Limited, Middlesbrough.

AS ASSOCIATE MEMBERS

A. Baxter, Hepworth & Grandage, Limited, Bradford.
B. Y. Bhiwandkar, Lobo Pattern Equipment, Bombay, India.
H. W. Calder, Woodhouse & Company, Limited, Doncaster.
T. H. Caulfield, Allied Ironfounders, Limited, Falkirk.
A. K. R. Choudhury, Eastern Railway Workshop, Jamalpur, India.
J. Cook, British Insulated Callender's Cables, Limited, Prescot.
C. H. Cousens, Cousens & Johnson, Batley.
D. H. Date, Mukand Iron & Steel Works, Limited, Bombay, India.
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L. J. Duffin, Babcock & Wilcox, Limited, Renfrewshire.
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C. G. Hanson, Radiation, Limited, Aston, Birmingham.
E. Johnson, Cousens & Johnson.
J. Lough, Armstrong, Whitworth & Company, Limited, Gateshead.
R. G. Matkin, State Electricity Commission of Victoria, Victoria, Australia.
F. S. A. Motajo, Nigerian Ports Authority, Lagos, Nigeria.
S. D. Mukherjee, Carron Company, Falkirk.
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M. G. Neu, Foundry Services, Limited, Nechells, Birmingham.
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J. L. Noke, A. W. Bell, East Oakleigh, Victoria, Australia.
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R. S. Oxtoby, P. & C. Garnett, Limited, Cleckheaton.
K. A. Pears, A. W. Bell.
J. S. Perks, Incandescent Heat Company, Limited, Smethwick.
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J. E. Porrett, Armstrong, Whitworth (Metal Industries), Limited, Gateshead.
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J. W. Richardson, Steels E.P., Limited, Sunderland.
E. S. Rush, Lake & Elliot, Limited, Braintree, Essex.
J. F. Shippen, Malayan Railway Administration, Railway and Port Operation, Kuala Lumpur, Malaya.
F. H. Slater, John Harper & Company, Limited.
P. O. Stammers, Lake & Elliot, Limited.
L. G. Tingle, Coleman-Wallwork Company, Limited.
G. Wager, Midland Motor Cylinder Company, Limited, Smethwick.
J. H. Walker, A. W. Bell.
G. B. Ward, Ruston & Company, Limited, Lincoln.
D. W. Watchorn, Ruston & Hornsby, Limited.
J. Williamson, North British Locomotive Company, Limited, Glasgow.
T. Wood, P. & C. Garnett, Limited.

TRANSFER FROM ASSOCIATE TO ASSOCIATE MEMBER

F. Brownbill, Hawker, Richardson & Company, Melbourne, Australia.
J. Reeves, Ferranti, Limited, Hollinwood, Lancs.
P. J. Wakeman, C. & B. Smith, Limited, Wolverhampton.
F. Watson, Hepworth & Grandage, Limited.

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J. A. Beaumont, Steel & Company, Limited, Sunderland.
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B. G. Haycock, Hepworth & Grandage, Limited.
B. Hellwell, Hepworth & Grandage, Limited.
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P. L. James, Williams Alexandra Foundry, Limited, Cardiff.
M. F. Jones, Ruston & Hornsby, Limited.
T. W. Jones, Head, Wrightson & Company, Limited.
R. Jordan, Leamington Pattern Making Company, Limited, Nr. Leamington Spa.
P. N. McIntosh, Jnr., Aberdeen Training College for Teachers, Aberdeen.
J. D. Marshall, Head, Wrightson & Company, Limited.
F. J. Mason, Hepworth & Grandage, Limited.
C. D. Newman, Manganese Bronze & Brass Company, Limited.
J. G. Oxley, Jaques Bros., Limited, Richmond, Australia.
G. A. Passley, National Foundry College, Wolverhampton.
G. W. F. Richards, Idoson Motor Cylinder Company, Limited, Tipton.
A. J. Smith, K. & L. Steelfounders & Engineers, Limited, Letchworth.
S. W. Smith, John Williams & Sons (Cardiff), Limited, Cardiff.
R. L. Taylor, Head, Wrightson & Company, Limited.
R. Turnbull, J. Vickers & Sons, Darlington.
J. K. Vickers, Fairey Aviation Company, Limited, Hayes, Middx.
K. W. Wall, Tees Side Bridge & Engineering Works, Limited, Middlesbrough.
R. M. Woodward, Fairey Aviation Company, Limited.
A. E. Young, Lake & Elliot, Limited.

ASSOCIATES (under 21)

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R. J. Ginn, Lake & Elliot, Limited.
A. W. Glass, Idoson Motor Cylinder Company, Limited.
P. J. Gray, Shaw Foundry Company, Willenhall.
D. C. Halls, Manganese Bronze & Brass Company, Limited.
T. Hanson, Thos. White & Sons, Limited, Paisley.
R. F. Latham, Bath Foundries, Limited, Bath.
A. J. Marriott, Stanton Ironworks Company, Limited.
M. J. Mason, Manganese Bronze & Brass Company, Limited.
B. F. Mays, Ransomes & Rapier, Limited, Ipswich.

(*Continued on p. 176, foot of col. 2*)

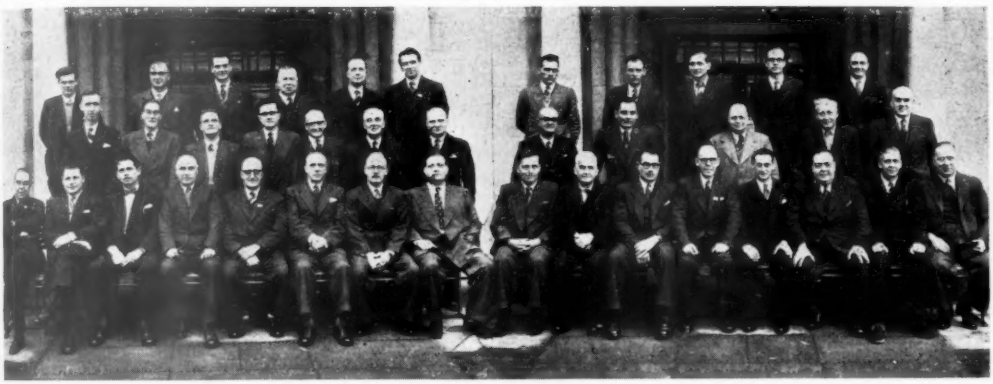
Patternmakers Visit Wadkins

Recently, a party of about 40 members of the National Society of Master Patternmakers visited the works of Wadkin, Limited, of Leicester, the well known woodworking—and patternshop—machinery manufacturers. The guests shown as a composite group in the accompanying illustration were first entertained to luncheon at the Grand Hotel, Leicester, three of the directors of the firm, Mr. Morris, Mr. Breeston, and Mr. Sims, acting as hosts. When expressing their thanks for the hospitality accorded, Mr. B. Levy, the president of the NSMP, drew attention to the enterprise of the firm in making available particularly to the patternmaking section of the foundry industry the very first wood pattern-miller. Wadkin's had also become the Society's first associate member (making patterns solely for their own use).

Afterwards, the party was conducted through the various departments of the firm where much interesting activity was seen. Demonstrations were seen of most of the types of woodworking machinery used in patternmaking, and special interest was shown in the new types of machine tools which Wadkin are developing for working non-ferrous metals. The visitors had a preview of a new universal milling machine, type W.T. which will be shown at the forthcoming Machine Tool Exhibition in London. This machine aroused considerable interest and the demonstrations of cutting, which were carried out on a typical metal pattern, provided good evidence that the machine has a profitable application on patternmaking and has a similar application on metal patterns to that of the firm's pattern miller on wooden patterns.

The visit ended with tea and refreshments in the works canteen, when a hearty vote of thanks proposed by Mr. Levy to the directors and staff for a most enjoyable and informative afternoon, was carried with acclamation.

Composite group photograph of members of the National Society of Master Patternmakers visiting Wadkin, Limited, Leicester.



Renfrew Foundry Goes to HDA

Part of one of the most modern foundry plants in the country, Renfrew Foundries, Limited, Hillington, Glasgow, which was closed down recently, and the future of which was uncertain, has been bought by an English firm. The Renfrew company, which has been closely connected with Rolls-Royce, Limited, in the production of jet-engine castings, recently paid off over 100 workers when they closed down their sand casting section. News of the take-over was received as "cheering" by Mr. George Middleton, general secretary of the Scottish T.U.C., who thought that presumably the take-over had some connection with the aircraft industry.

It is the die-casting section of Renfrew which has been taken over by High Duty, supplementing their existing facilities in this line at Slough. Additionally, there is news that the extensive mechanization schemes of the Renfrew sand foundries have been sold *en bloc* to an undisclosed buyer.

High Duty Alloys, Limited, as well as other works, operate one of the largest factories at Slough, and employ over 1,100 workers. A major part of their production has been for the motor car industry and consequently in recent months they have been forced into paying off workers because of the "cut back" in car production.

Permanent-magnet Materials

Three new permanent-magnet materials, semi-columnar in structure, to be known as Alcomax II S.C., III S.C., and IV S.D., are being introduced by members of the Permanent Magnet Association. These materials are modified forms of P.M.A. Columax, which has a high magnetic performance, but which is not suitable for economic bulk production. Being semi-columnar these materials are more easily adapted to existing methods of large-scale manufacture. In performance they are intermediate between Alcomax and Columax, but up to the present time manufacturing experience has been insufficient to establish precise magnet specifications.

The development of the crystal structure necessary to give an improved performance is limited to certain shapes and sizes, plain solid cylinders having a diameter over $\frac{1}{4}$ in. and a length somewhat less than the diameter being the most suitable. Manufacture in the early stages will be limited to such magnets. These materials will be of particular interest to loud speaker manufacturers, especially where solid-cylindrical magnets are already being used, as it will be possible to reap the benefits of the new material without design change or re-tooling.

Correspondence

COST OF DUST COLLECTION

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—I have been very interested to read the article on page 113 of the February 9 issue of the JOURNAL on the relative costs of dust collection with various forms of collecting apparatus, but I think there is a danger of some of the data being incorrectly used, unless it is fully appreciated that the figures put forward relate to gas-cleaning equipment and are not equally accurate when applied to dust-collecting apparatus dealing with the normal dust problems in the foundry.

My firm have installed dust collectors of many different types, including the ordinary cyclone, high-efficiency cyclone, multi-cellular collector, fabric filter and wet collector, and in consequence have no particular axe to grind in regard to any particular type of collector. I do think, however, there is a danger of the cost of fabric filters for a normal industrial application being grossly over-estimated from the figures given in Table III accompanying the article in question. Not only in regard to the initial capital cost, but also in the cost per annum for upkeep do I consider the figures given in this table out of proportion to the cost of other types of collectors. No doubt both these figures are enhanced in the particular application covered by the article, because filter material has to be of a type suitable for high temperature and consequently is very much more expensive than the filter cloth suitable for normal industrial application.

In addition I would not expect it to be necessary to change the filter material anything like so frequently in ordinary industrial use as is suggested in this Table, which is based on a complete change of filter material once in twelve months in the one case and twice annually in the other.

In conclusion I would like to make it quite clear that I am not in any way criticizing the figures given in the Table as relating to the particular application dealt with, but only drawing attention to the possibility of their being erroneously applied to normal dust-collecting plant in the general run of iron and steel foundry applications.—Yours, etc.

WALTER L. GEE,
Managing Director.

Newton Collins, Limited,
Barford Street Works,
Birmingham 5.

New IBF Technical Sub-committees

The Technical Council of the Institute of British Foundrymen has recently appointed the following new technical sub-committees:—

Sub-committee T.S.51—Terms and Definitions for the Ironfoundry Industry: This sub-committee has been formed, under the chairmanship of Mr. J. W. Gardom (past-president of the Institute), to review and amend the draft terms and definitions for the iron-foundry industry prepared by the British Standards Institution.

Joint Committee on Data on Cast Iron: Jointly with the British Cast Iron Research Association, this sub-committee will review current available data and assist the British Standards Institution in the revision of B.S.991.

Dr. A. B. Everest (president of the Institute) has been appointed chairman of the sub-committee of the Institute.

Mobile German Laboratory

Dr. W. Patterson, whose appointment to the Chair of Foundry Technology at the University of Technology at Aachen, Germany, was reported in the FOUNDRY TRADE JOURNAL (October 27, 1955) describes in *Giesserei*, January 5, the new Institute for Foundry Technique at Düsseldorf, opened last October. This new Institute consists solely of laboratories, housed in a new building attached to the "House of the Foundry Industry" at Düsseldorf. There are neither moulding nor melting shops; the terms of reference for the new Institute are as follow: Applied research, advisory service for foundries, production supervision and development work in foundries and information service for new methods.

One of the most interesting features of the service offered by the Institute is the creation of a "mobile laboratory." As experience has shown that only a small number of foundries possess sufficient testing equipment and adequately trained staff to carry out correct shop investigations, a 2-ton van was bought and equipped as a mobile test-house. The van, looking like a huge ambulance, with large windows on either side, contains two laboratory benches along its length which carry a full range of foundry testing-equipment.

A transformer for 220 and 380 volts can be connected to the power supply of any visited foundry, and provides electricity for light, power and heating. A 20-gall. water tank built-in above the driver's cabin supplies distilled water. There are sufficient drawers underneath the laboratory benches to carry such instruments as immersion and optical pyrometers, a crane weighing machine recording thermocouples, gas-analysis apparatus, etc. The van is at the same time the means of transport for the foundry technicians and metallurgists who carry out the tests on the spot. A second mobile laboratory is planned for the Stuttgart branch.

BRITISH EXHIBITORS and buyers, home again after the Leipzig Spring Fair, report a number of deals in both directions completed, and many have good hopes that negotiations now in hand will lead to the conclusion of further contracts. Perhaps the outstanding event of the Fair was the announcement by the president of the Bank of China, Mr. Man Han-Chen, that China wants to place orders abroad for the supply of no less than 1,400,000 tractors. The David Brown tractor group at Meltham, Huddersfield, issued a statement on March 23 which said: "We have reason to believe that the present Government embargo on the export of agricultural tractors to the People's Republic of China is now being urgently considered and may be lifted in the next few months. China's willingness to buy British tractors, which has only recently been publicized in this country, was made known to a representative of this company who visited China 18 months ago."

Institute Elects New Members

(*Continued from p.* 174)

W. Norwood, C. A. Parsons & Company, Limited, Newcastle-upon-Tyne.
R. G. Orford, J. & E. Hall, Limited.
T. J. B. Parker, Lake & Elliot, Limited.
R. C. Peake, Lake & Elliot, Limited.
J. W. Rice, W. & T. Avery, Limited, Birmingham.
C. K. Saddington, Jaques Brothers, Limited.
D. W. Turner, J. & E. Hall, Limited.
P. M. Walker, T. H. & J. Daniels, Limited, Stroud, Glos.
N. A. Wallis, Tees Side Bridge & Engineering Works, Limited.
M. G. Wilson, Manganese Broze & Brass Company, Limited.
R. S. Wood, Kaye & Company, Huddersfield.
C. J. Wyard, Manganese Bronze & Brass Company, Limited.

Cast Manganese Steel

*By E. Piwowarsky and H. L. Roes**

[SLIGHTLY ABRIDGED]

(*Continued from p.* 149)

Test Results

The investigations on the effect of wall-thickness produced the following results:—all the melts were uniform in that the grain-size increased rapidly with increasing cross-section. At about 1,550 deg. C., the effect of casting temperature and wall-thickness was over-riding, causing a sudden change in grain type from globular to dendritic or from fine to coarse, and grain growth was also observed in dendritic

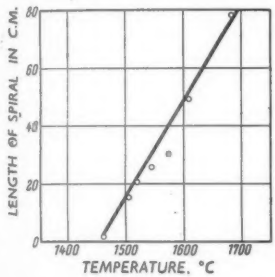


FIG. 20.—*Effect of casting temperature on length of spiral.*

structures. This growth was not uniform however. Parallel with this, there was a continually-increasing carbide-precipitation, except in the case of the previously mentioned 20-mm. ($\frac{3}{4}$-in.) bars. The old rule of thumb still often used to-day, not to exceed a wall thickness of 60 mm. ($2\frac{3}{8}$ in.), was confirmed in the following manner: with the 10-, 20-, 30- and 40-mm. bars ($\frac{3}{8}$- to $1\frac{1}{2}$-in.) the grain, surrounded by grain-boundary carbide, grew steadily. The 60-mm. ($2\frac{3}{8}$-in.) bar, however, showed a reduction in grain size and therefore heavier carbide-precipitation both at the boundaries and in the grain. The amount of carbide by area rose to about 20 per cent. A further increase in thickness then caused a marked grain-growth with a simultaneous increase in carbide precipitation up to about 35 per cent. (by area). Thus, at just about 60 mm. ($2\frac{3}{8}$ in.) a marked deterioration set in. It appeared, however, that with increasing casting temperature this sudden increase in precipitation took place at smaller wall thicknesses. With melt No. 2 even the 40-mm. ($1\frac{1}{2}$-in.) bars had accumulated carbides at the grain boundaries. The initial melts had less tendency to form dendrites and with high casting temperatures (1,650 deg. C.) solidified with globular grains, but very coarse. Here, too, with a temperature exceeding 1,570 deg. C., grain counting was no longer possible. It would be a good thing to investigate why duplex steel has a greater tendency to form dendrites.

The high proportion of carbides in the thicker bars raises the question of the deep hardenability on heat-treating very heterogeneous cast structures. For this reason annealing tests were made on bars 90, 120, 150 and 180 mm. dia. ($3\frac{1}{2}$ to 7 in.). All the test pieces were given the heat-treatment normal for their section and the whole fracture areas were microscopically examined. However, the structures were entirely austenitic, even with the 180-mm. (7-in.) bar (held 7 hr. at 1,050 deg. C. and quenched in water).

Effect of Casting Temperature

The factor chiefly dominating the crystallization and grain formation was the casting temperature. The melts investigated covered all casting temperatures in the range 1,460 to 1,695 deg. C. and of these the most important are presented here

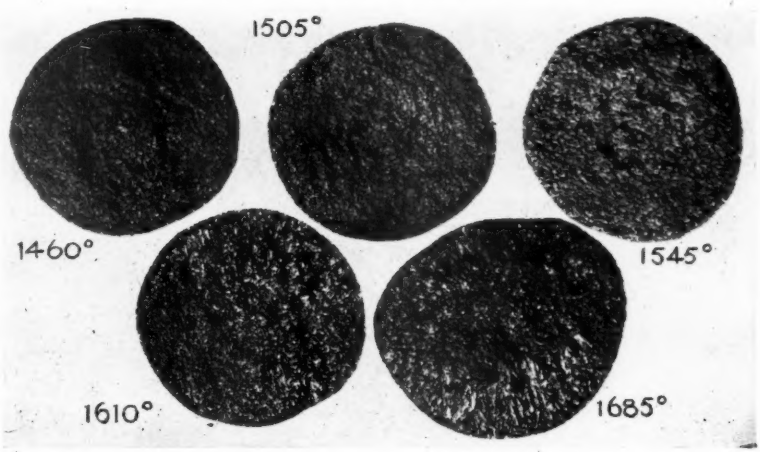
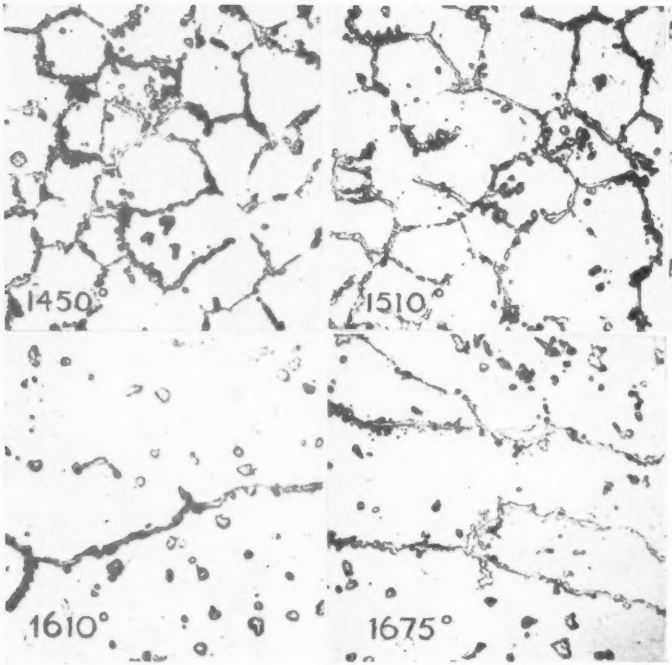


FIG. 1.—*Effect of casting temperature on grain size (actual size).*

* The Authors were attached to Aachen Technical High School but Professor Piwowarsky died before publication.
Acknowledgment is made to British Steel Castings Research Association for supplying the translation.



FIGS. 22 TO 26.—*Structures of 60-mm. bar from melt S with increasing casting temperature* (× 50).

(see Table II). The lowest casting temperature gave the finest grain, but at the same casting temperature the grain coarsened with increasing wall thickness. Attempts to determine the castability with the Croning-Schneider spiral were unsuccessful in that the spiral mould is not very suitable for manganese steel. The taper section of 8 by 6 by 6 mm. (0.42 cm^2) and the runner with an effective head of only 14 cm. (5½ in.) and a section of 1.5 tapering down to 0.5 cm^2 (the Nielsen mould) are too small for manganese steel as it "sets" rapidly, and, in spite of the attached pouring basin, there is too little pressure. The length of spiral depends very much on the pouring speed and height. The curve in Fig. 20 from the recorded data agrees with what has been found in practice, namely that manganese-steel cannot be cast at below 1,450 deg. C. Table IV gives some values for the whole temperature range. Fig. 21 shows the fractures of 40-mm. (1½ in.) manganese-steel bars cast from initial melts, and it can be seen that the grain becomes coarser with rising temperature.

Nevertheless, there appear to be limits to the grain growth and increased carbide precipitation which occur with increasing casting temperature on the one hand and greater wall thickness on the other, and these are about 1,700 deg. C. and thick-

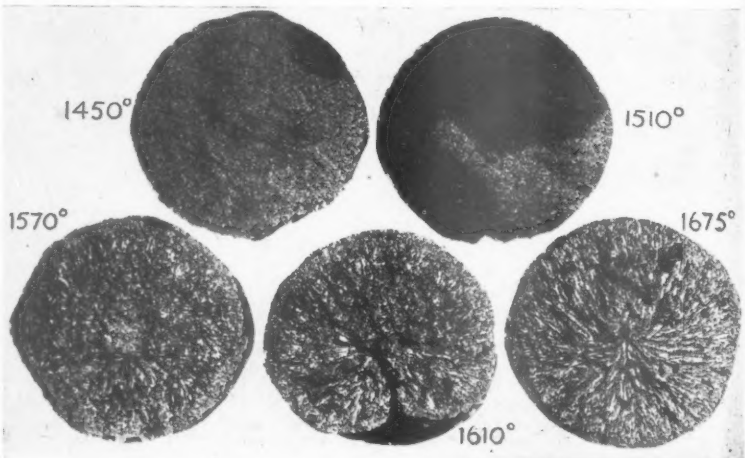


FIG. 27.—*Fracture of 60-mm. bar from melt S, with increasing casting temperature (actual size).*

TABLE IV.—*Effect of Pouring Temperature on Castability.*

No.	Pouring temp. deg. C.	Length of spiral, cm.
1	1,460	2
2	1,505	15.1
3	1,520	20.7
4	1,545	26.0
5	1,575	29.7
6	1,610	49.7
7	1,685	77.1

nesses above 60 mm. (2⅜ in.). Up to these values one must count on steadily-increasing grain-growth and carbide precipitation.

Since various influences play their part on manganese-steel, some of which are probably still unknown, five series, each of seven bars, were cast, all of the same composition (melt S) in order to eliminate any possible effect of compositional difference. No difference between these and the other melts in the foundry could be detected, and the general tendency remained the same. Figs. 22 and 26 show micrographs of the structures of the 60-mm. (2⅜-in.) bar of melt S with increasing temperature; Fig. 27 shows the corresponding fractures.

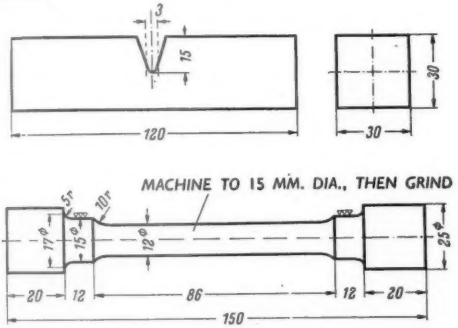


FIG. 28.—*Dimensions of the impact-test specimen.*
FIG. 29 (*below*).—*Dimensions of tensile-test specimen.*

As a rule, one should try to use the lowest possible casting temperature applicable to each thickness—as long as the castability permits. Only then can one expect a perfect structure. It would be worth while investigating systematically the effect of grain shape—governed by casting temperature—on the mechanical properties, with which question this Paper refrains from dealing. Some random tests on tensile, transverse, and impact specimens cast at different temperatures produced the values given in Table V. The samples were from a melt with the following composition: 1.12 per cent. C, 12.86 per cent. Mn, 0.48 per cent. Si, 0.036 per cent. P and 0.010 per cent. S. The impact-test specimen is shown in Fig. 28, and the tensile specimen in Fig. 29. For transverse tests, 30-mm. (1¼-in.) bars heat-treated for 1½ hr. at 1,050 deg. C., were used.

As mentioned in the introduction, opinions differ about the possibility of changing the structure by heat-treatment. A systematic investigation on the

TABLE V.—*Effect of Grain Type on the Mechanical Properties of Manganese-steel.*

Grain type and casting temp.	Impact strength, kgm./cm.	Ultimate tensile strength tons per sq. in.	Transverse strength tons per sq. in.	Deflection mm.
Globular 1,460 deg. C. ..	17	25.4 (52.6)*	55.9 (86.4)	9 (61)
Fine dendritic 1,550 deg. C. ..	13	24.1 (51.4)	50.8 (82.6)	10 (95)
Coarse dendritic 1,620 deg. C. ..	6	23.5 (50.1)	49.5 (83.8)	10 (58)

* The figures in brackets are for specimens heated for 1½ hr. and quenched in water.

"dependency of structure on heat-treatment" is therefore to be regarded as urgent. The Authors' tests show that the structure is refined by the ordinary heat-treatment of 1½ hr. at 1,050 deg. C. and quenching in water, for 30-mm. (1¼-in.) bars, but that too high a temperature or too long a holding time will recoarsen the grain. It remains a question whether this applies to all wall thicknesses. In the investigation of three bars which were cast together at 1,500 deg. C. and were tested:—(*a*) as-cast; (*b*) after holding 1½ hr. at 1,050 deg. C

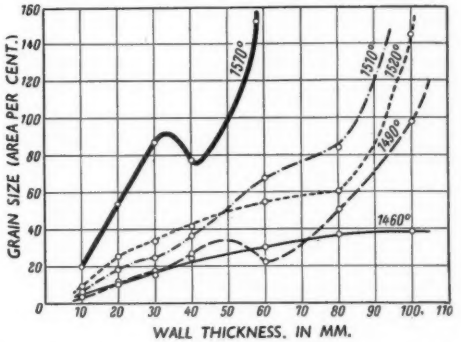


FIG. 30.—*Relation between grain size and wall thickness of manganese-steel for different casting temperatures.*

and quenching in water, and (*c*) after treatment as in (b) with an additional hour at 1,200 deg. C.; the tensile strength, transverse strength, and deflection* were:—(*a*) 52.7 tons per sq. in. transverse strength with 4 mm. (0.16 in.) deflection; (*b*) 94.0 tons per sq. in. transverse strength with 55 mm. (2.16 in.) deflection, and (*c*) 45.1 tons per sq. in. transverse strength with 11 mm. (0.43 in.) deflection.

Hence, the question at once arises as to how much the as-cast structure can be improved by heat-treatment, *i.e.*, whether a very fine as-cast structure can be still further refined by heat-treatment. Tests did, in fact, show, for instance, that the radial structure of series 3 could, at least in the core zone, be changed to globular structure, whilst on the other hand, the very fine structure of series 1 was coarsened slightly by the heat-treatment.

* The Authors give data on only two of these factors.

Cast Manganese Steel

The behaviour of the steel in relation to annealing time and temperature and their effect on the transverse strength and deflection were determined in a single test. Bars 30-mm. (1¼-in.) dia. were cast at 1,560 deg. C. (from a melt with 1.2 per cent. C, 11.4 per cent. Mn, 1.48 per cent. Si, 1.29 per cent. Cr) and annealed on the one hand with increasing holding times and on the other at rising temperatures. The results are shown in Table VI, the readings being taken at the first appearance of cracks. It will be seen from the data that the annealing temperature is of the greatest importance even although the maximum strengths and deflections do not follow similar lines.

TABLE VI.—*Results of Heat-treatment—Effect of Annealing Time and Temperature.*

Bar.	Treatment deg. C.	Dia. mm.	Load kg.	Transverse strength tons per sq. in.	Deflection mm.
1	untreated	31.3	5,150	52.7	4
2	1 hr. 1,050	29.0	4,800	79.4	34
3	1¼ hr. 1,050	28.5	5,000	86.4	46
4	1½ hr. 1,050	27.5	4,800	94.0	55
5	1¾ hr. 1,050	28.3	5,000	88.9	61
6	2 hr. 1,050	30.8	4,900	64.7	43
7	1½ hr. 950	29.4	4,850	76.2	33
8	1½ hr. 1,000	28.7	4,550	76.3	67
9	1½ hr. 1,050	27.5	4,900	93.3	55
10	1½ hr. 1,100	29.5	5,000	76.3	45
11	1½ hr. 1,150	29.6	4,100	62.8	27
12	1½ hr. 1,200	29.0	2,750	44.7	11

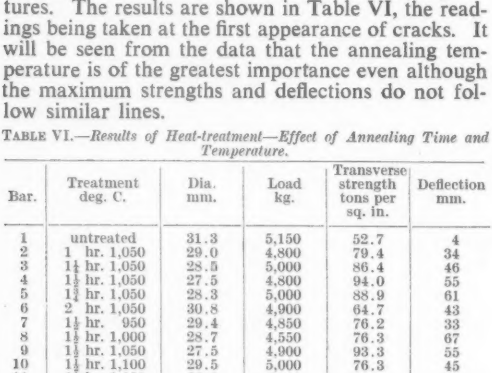


FIG. 31.—*Relation between grain size and casting temperature of manganese-steel for different wall thicknesses.*

The fall in the values with excessive annealing time and temperature which F. Roll[15] puts down to grain growth, could also be associated with the increasing decarburization. The micrographs do not give a clear answer to this question; all the same, it is the micrographs of the specimens annealed at rising temperatures which show grain-refinement at up to 1½ hr. at 1,050 deg. C. and a subsequent growth. The heat-treatment was done in a properly-controlled electric furnace, and the quenching in a water tank immediately underneath it. Since in industry about 2 min. elapse between opening the furnace door and the quench, the Authors' tests may be regarded as "ideal." In order to demonstrate the effect of pre-cooling, some bars were quickly quenched in cold water, others after 2 min. cooling in the furnace, and others after 2 min. cooling in air. Table VII shows the fall in values after the delayed quench, although these data should be regarded only as indicative.

TABLE VII.—*Effect of 2 min. Pre-cooling on the Mechanical Properties*

Treatment.	Transverse strength tons per sq. in.	Deflection mm.
1½ hr. at 1,050 deg. C., water-quenched	93.3	63
1½ hr. at 1,050 deg. C., cooling 2 min. in furnace then water	90.2	56
1½ hr. at 1,050 deg. C., cooling 2 min. in air, then water	89.5	53

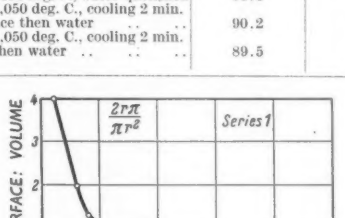


FIG. 32.—*Grain size of manganese-steel in relation to surface : volume.*

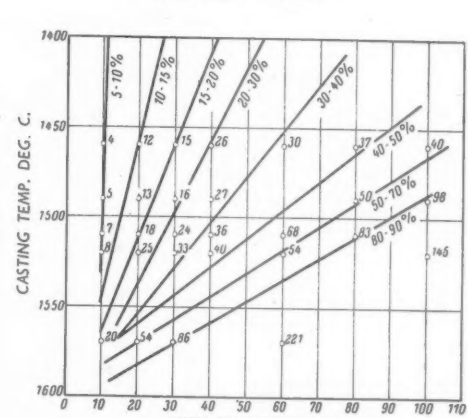


FIG. 33.—*Composition ranges of manganese-steel having same grain size, in relation to temperature and wall thickness.*

Grain Counting

A grain count was made on one of the series with globular grain. Not having a planimeter, a comparison of the areas was used as a basis, a count of thirty grains was made and their area, as a percentage of 100 sq. cm., determined. Fig. 30 gives the results of the grain area determinations and confirms what has been previously said about grain growth.

Apart from the increasing grain-growth with wall thickness, the curves for duplex steel (compare the curves for 1,490 and 1,520 deg. C. in Fig. 30) show first a gentle rise, then a peak for the 60-mm. ($2\frac{1}{4}$-in.) bar due to increased carbide-precipitation, and finally, the steep rise for marked grain-growth.

The initial melts are in the main in line with the duplex melts. The displacement of the peak to smaller wall-thicknesses is seen in the curve for 1,570 deg. C., *i.e.*, the increased carbide-precipitation at higher temperatures takes place at smaller thickness. Thus there is not one minimum grain-size for all thicknesses which can be obtained by varying the casting temperature, but different, theoretically obtainable characteristic minima which are, however, dependent on the casting temperature. The requirement of smallest possible cross-sections is therefore justified, especially as with greater thicknesses the grain-growth occurs much more quickly. Fig. 32 shows the same tendency.

These results show that there are zones of equal grain-size dependent on casting temperature and wall-thickness (Fig. 33). The family of curves thus indicates at what temperature a casting of given wall-thickness should be cast in order to have a required grain-size. Expressed in another way, Fig. 33 indicates the grain-size, and consequently the structure, which will be obtained with a given wall-thickness at the corresponding casting temperature which takes the castability into account.

Railways Modernization

Now that the British Transport Commission has taken its decisions on the two main outstanding questions on which much of its vast railway re-equipment programme depends, British industry may be assured that the modernization plan is really getting under way. Long-term economies in British Railways' electrification programmes are expected to result from the adoption of the change-over from direct current to alternating traction supply in future projects, while the BTC's intention to treat the fitting of vacuum brakes to freight wagons as an "emergency operation" should produce the higher level of operating efficiency that manufacturers have been demanding for many years. It is, at any rate, the commission's fervent hope that these measures will enable it to recapture much of the freight traffic it has lost in recent times.

Moreover, the decision to adopt an a.c. 50-cycles overhead wire system at 25,000 volts against d.c. systems already in use at much lower voltages will prove of great benefit to the electrical manufacturing industry. It will mean that engineering concerns will be able to concentrate on making a.c. equipment which has a much more ready market abroad. According to the commission, the new system will be simpler, cheaper, and quicker to instal, and will achieve savings of 27,000 tons of copper and 16,000 tons of steel.

Current for the new system, which is to be used on 1,210 of the 1,450 route miles scheduled for electrification will be obtained from the national grid.

New Patents

(Copies of complete specifications are obtainable from the Patent Office Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

743,634, 743,635, and **743,636.** Philips Electrical Industries, Limited, Spencer House, South Place, Finsbury, London, E.C.2.

Improvements relating to the manufacture of permanent magnets of iron-base alloys containing Ni, Al, and Co as principal additional elements. The crystals are predominantly orientated such that the (100) direction is substantially parallel to the preferred magnetic direction in which the magnet is magnetized. The magnet body between the two pole faces during solidification of the alloys is surrounded over the major portion of its length by a chemically exothermic material. At least one of the two pole faces is cooled. **743,634** specifies that the material contains a conductive ignition winding which is heated by electrical means, for example, by high-frequency induction, to ignite the material before the molten metal is poured into the mould. **743,635** is different in that it states that at least a major portion of the side wall of the casting mould between the pole surfaces of the magnet consists of metal sheet substantially insulated against radiation and/or conduction of heat from the side wall during casting. **743,636** specifically refers to the fact that molten metal or metal alloy is poured into a space surrounding the chemically exothermic material so that it is ignited and the iron-base alloy is poured into the moulding space only afterwards.

743,643. Rudolf Nowack, Waldrol-Hermesdorf/Rheinland, Germany.

A process for imparting an improved finish to the surface of iron or copper (or alloys of either) by diffusion treatment. The surface is reacted with free chlorine in conjunction with a vaporized chloride of titanium, tin, chromium, antimony, silicon, zinc, aluminium, copper, carbon, boron or nitrogen at a temperature of from 850 to 1,250 deg. C.

743,791. General Electric Company, Limited, Magnet House, Kingsway, London, W.C.2.

Improvements relating to the production of magnetizable powders in the manufacture of permanent magnets; also relates to magnets produced from such powder. Patent No. **743,792** deals with similar processes.

743,969. Aktiebolaget Westin and Backlund, 8 Liljehomsvagen, Stockholm 9, Sweden.

Inversion arrangement for moulding machines which consist in combination:—(1) A unit adapted to be inverted from a squeeze position to one in which the pattern removal may be effected; (2) a mould table and a squeeze plate; (3) an oscillatory inversion shaft having a crank secured thereto by inverting the unit; (4) pneumatic or hydraulic means for oscillating the shaft. This consists of (*a*) an operating cylinder with a piston operating in the cylinder, and (*b*) a piston rod connected to the piston. A rigid link, pivoted at one end to the piston rod, and at the other end to the crank pin of the crank, is so placed relative to the crank as to impart a moment thereto for the piston rod throughout the oscillation of the shaft through an angle of at least 180 deg. without any "dead-point."

Correction

It is regretted that in the list of "New Patents" published in the JOURNAL, February 9, a wrong number was attached to that of the Ford Motor Company, Limited, dealing with nodular-iron castings. The correct number is 743,121.

Notes from the Branches

Bristol and West of England

An instructive afternoon was enjoyed by West-Country members of the Institute of British Foundrymen on February 18, when Mr. C. J. Williams (of High Duty Alloys, Limited) gave a very interesting Paper dealing with light-alloy practice. Referring to the increasing use of light alloys in the aircraft industry during the past few years, Mr. Williams said that the production of castings in these alloys to the necessary high-performance standard required had done much to promote a greater faith in such materials for many engineering purposes. New and better alloys were constantly being developed, and such alloys were now accepted as an essential feature of the engineering world. Illustrating his Paper with slides, Mr. Williams showed at the meeting some of the more complicated castings which were daily being produced by normal production techniques—sand, gravity- and pressure-die-casting.

A lively discussion followed the presentation of the Paper, and in his replies, Mr. Williams made the following points:—(*a*) When producing zirconium-bearing alloys, great care must be exercised over the grain size, which is critical for every type of casting. Such attention will often materially assist in reducing any tendency to segregation. (*b*) Dealing with the application of shell cores in the light-alloy field, it was the lecturer's view that such cores often presented great advantages over other types, especially in the matter of "knock-out properties." Care was essential in the design of coreboxes for shell cores, and cast-iron could be used very successfully for their manufacture. (*c*) When producing magnesium alloys with CO_2-bonded cores, sulphur had been found to be a good inhibitor, the amount used dependant upon the thickness of the core section. Low-temperature drying of moulds was always found to be less detrimental to the inhibitor than the use of a blowlamp.

(*d*) Usually it was found unnecessary to make any additions to secure good breakdown properties in CO_2-bonded cores in light-alloy practice, and venting as in normal cores could be used. (*e*) When pressure-die-casting, it was usually found that high injection-pressures tended to give soundest castings. (*f*) The "life" of resin patterns in light-alloy practice was often to be found comparable to that of aluminium patterns.

Mr. D. F. B. Tedds, in proposing a vote of thanks, said that the Paper had been a very interesting one, and in seconding, Mr. J. R. Hayward said that Mr. Williams had covered a great many aspects of the subject and given everyone present a real insight into the many fields which the light-alloy industry covered. Mr. Williams was to be congratulated in having so ably imparted much information to members.

Annual Dinner

The branch annual dinner was held at the Grand Hotel, Bristol, on March 3, and sixty members and friends were present to receive the guests, who included Dr. A. B. Everest, the national president of the Institute, and Mrs. Everest, Mr. Lambert and Mrs. Lambert, Mr. Bevan and Mr. Wall (the president and hon. secretary of the Wales and Monmouth branch), together with their wives, and Mr. Poole and Mr. Bailey, of the Bristol College of Technology. Three past-presidents of the Institute were also at the high table—Mr. John Bell, Mr. N. P. Newman, J.P., and Mr. R. B. Templeton.

The toast of "The Institute" was proposed by Mr. D. P. Williams, branch senior vice-president, who reminded those present that the Institute was no longer insular in its activities, but was forming branches in various parts of the Commonwealth. The foundry industry owed much to the activities of the Institute, both through the medium of papers presented to the many branches by individual members, and through reports compiled by the sub-committees. The holding of the International Foundry Congress in this country last June had done much to enhance the reputation of the Institute. Members would be grateful, said Mr. Williams, for the recently-announced library facilities available through the Institute.

Replying to the toast, Dr. Everest said that he always had happy memories of visits to the Bristol branch area, which was a very scattered one embracing several of the best-known specialist foundries in the country. Many successful Institute functions, including the national conference in 1949 and national works visits day in 1955, had been held in that area and had reflected great credit on the respective branch secretaries, Mr. A. Hares in 1949, and the present secretary, Mr. G. W. Brown.

Proposing the toast of "The Bristol and West of England Branch," Mr. Lambert endorsed Dr. Everest's remarks and said that the branch stood high in the esteem of the Institute. The branch was well represented on various committees and Mr. G. W. Brown, the hon. branch secretary, was doing an excellent job of administration in so scattered a branch.

Replying to the toast, Mr. Richards referred to the apprentice meetings which had been organized, reporting that the first meeting had attracted 71 boys, while the meeting arranged for March 10 would be attended by over 90. Thanks were due to Mr. Poole and Mr. Bailey, of the Bristol College of Technology, for help and interest in the promotion of these meetings.

Mr. F. K. Vickery, in proposing the toast of "The Visitors and Ladies," spoke of the pleasure the branch had in welcoming Dr. and Mrs. Everest, all looked forward to seeing Dr. Everest holding the honoured office of chairman at the International Foundry Congress in Stockholm next year. All members of the Institute were grateful also to Mr. Lambert for efficient and untiring work on their behalf. He concluded by welcoming guests from the neighbouring Wales & Monmouth branch, representatives from the Bristol College of Technology, and past-presidents of the Institute.

The evening was brought to a close with an excellent entertainment provided by Mr. L. Nott and a party of local artistes.

Papers for 1957 IBF Conference

The Council of the Institute of British Foundrymen is prepared to receive offers of papers for presentation at the 54th annual conference to be held in June, 1957. Members and non-members who contemplate offering papers are asked to communicate immediately with the secretary of the Institute, who will forward them a copy of the Institute's publication "Notes for the Guidance of Authors of Papers." It is desirable that all formal offers of papers should be made not later than June 1, so that they can be considered by the meeting of the appropriate committee which will be held in mid-June.

UK at Damascus Fair

In view of the growing importance of British exports to the Middle East, the Federation of British Industries has announced that it is organizing for the first time a United Kingdom pavilion at the forthcoming International Trade Fair at Damascus, which takes place from September 1 to 30 this year. The project will be carried out by the Federation's subsidiary company, British Overseas Fairs, Limited, and has the full support of the Board of Trade.

The Damascus Fair, which was first held in 1954, is the only annual trade fair in the Middle East. It has become an established centre of trade for all the Arab countries, and last year it attracted 1,000,000 visitors, of whom 100,000 came from neighbouring countries, including Iraq, Lebanon, Jordan, Saudi Arabia and the Persian Gulf States. It offers a valuable opportunity for British exporters, particularly in the spheres of engineering and capital products and some kinds of consumer goods. Even Syria itself, which is a comparatively small market, took £7,600,000 worth of British exports in 1955 and its new seven-year plan provides for the further expenditure of some £49,000,000 on irrigation, roads, aerodromes, hospitals, laboratories, etc. The wealth of some of the other Arab countries is, of course, considerably greater.

Last year 22 other countries, had national pavilions at the Damascus Fair; there was no UK pavilion, but some British goods were displayed on the stands of Syrian agents. The proposed UK pavilion at this year's fair will cover an area of about 20,000 sq. ft.; in addition there will be some 20,000 sq. ft. of outside space, where agricultural machinery and other large exhibits can be displayed.

Improved Terms for Export Credits Guarantees

The Export Credits Guarantee Department of the Board of Trade propose to make three immediate improvements in the terms of cover offered to those trading overseas as follow:—(*a*) To reduce by between 10 and 20 per cent. the rates of premium on exports to the more stable markets (110 out of 170) which cover destinations of over 80 per cent. of our total export trade in 1955, and include the markets where there is the fiercest competition; (*b*) to remove the special limitations imposed on extended short-term cover when it was introduced a year ago; and (*c*) to improve the terms on which cover is given for goods held in stock overseas. Each of these improvements is justified on commercial grounds and has been approved by ECGD's advisory council.

At present the average premium for all business up to six months with all markets covered under section I of the Act is 11s. 7d. per £100 insured—for 85 to 90 per cent. cover against "risk on the buyer," transfer, and political risks. Before the war, for example, ECGD rates for 75 per cent. cover against insolvency risk only ranged, in a representative policy, from something like 12s. 6d. to 25s. according to the spread of risk. The cover provided nowadays is greater than before the war, but the premium is down. This has been made possible by increasing the spread of business and risks, and by efficient management.

The Association of Bronze and Brass Founders announce the postponement of the members' and advisory-service meeting which were to be held in the Midland area on April 17.

New BSCRA Research Laboratories

The building of new research laboratories of the British Steel Castings Research Association has now commenced on a site at East Bank Road, Sheffield, and the premises are scheduled for occupation during next autumn. The Association, formed three years ago, has hitherto been dependent upon facilities kindly provided by a large number of its member firms and by several universities, including, in particular, the Refractories and Metallurgy Departments of Sheffield University. A stage has now been reached, however, when the provision of its own laboratories and experimental workshops and foundry is indispensable to the effective prosecution of the wide range of basic-research and technical-development work in progress.

Layout

The new headquarters, which is illustrated by the architect's drawing (Fig. 1) will represent a first stage in development. The building to the left of the illustration will accommodate administrative offices, the library and information section and a small conference room; and provision is being made for the later addition of a second floor that can be used for additional laboratory and office accommodation. The experimental foundry, laboratories and workshops are to be housed in the taller building to the right of Fig. 1. This building contains a central bay 40 ft. span by 75 ft. long—which is served by a floor-operated, electric overhead travelling crane of 3 tons capacity—and two 18-ft. span side bays, also 75 ft. long, which accommodate metallurgical, chemical and sand laboratories together with a machine shop, test-house and stores. The main bay will be equipped for all routine foundry operations, space being left free for the erection, as required, of experimental equipment and apparatus. Melting facilities will comprise a 600-lb. capacity carbon-rod-resistor furnace as well as a 30-lb. capacity spark-gap high-frequency electric furnace.

A further building behind the offices will accommodate a special laboratory for research into problems relating to the control of dust in steelfoundry operations—a field of investigation to which about 20 per cent. of the Association's resources are devoted. The East Bank Road site provides adequate space for future extensions, the present buildings occupying approximately half the total site area.

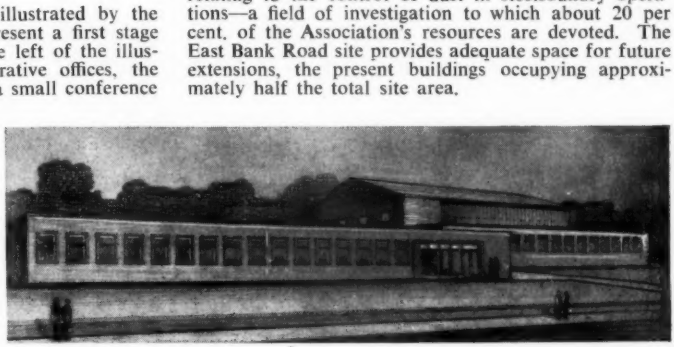


FIG. 1.—*Architect's impression of the new Sheffield premises for the British Steel Castings Research Association, the construction of which has now commenced.*

Personal

Mr. A. TALBOT announces an impending change of home address to 11, Sweetcroft Lane, Hillingdon, Middlesex.

A presentation has been made to Mr. G. H. MERCER, managing director of Brookes (Oldbury), Limited, iron-founders and engineers, on his retirement.

Mr. E. R. BARTLETT, who will be the next mayor of Warwick, is manager of the prototype department of Sidney Flavel & Company, Limited, gas appliance manufacturers, of Leamington Spa.

MR. T. S. CROWE, M.SC., has been elected president of the Institution of Mechanical Engineers. He is chairman of the North British Locomotive Company, Limited, and Carntyne Steel Castings Company, Limited.

Monsanto Chemicals, Limited, announce that SIR MILES THOMAS has accepted its invitation to become chairman in succession to MR. O'NEAL. He will assume this office not later than July 1, taking up full-time service with the company.

Mr. G. GEOFFREY DEAKIN will leave his position as publicity manager of the Marshall Organization at the end of this month to take up a new appointment as marketing manager for the Caterpillar Tractor Company's new British subsidiary.

Mr. JOHN MACKENZIE MITCHELL has been appointed chief engineer of the turbine department at the Fraser & Chalmers Engineering Works of the General Electric Company, Limited, Erith (Kent). Aged 31, Mr. Mitchell began his career with the company in 1940.

SIR BEN LOCKSPEISER, K.C.B., F.R.S., has joined the board of Tube Investments, Limited, and has been appointed scientific adviser to the Tube Investments group. Sir Ben recently retired from the Department of Scientific and Industrial Research.

The services of Sir HAROLD SPENCER JONES, F.R.S., who recently retired from the position of Astronomer Royal, have been retained in a consultancy capacity by the group headed by S. Smith & Sons (England), Limited, which manufactures automobile, aviation, marine, and industrial instruments, clocks, etc.

After 55 years' service with Richard Berry & Son, West Bromwich, MR. GEORGE WORTHINGTON is retiring from his post as general manager of this branch of the Brockhouse Group, but he will continue in an advisory capacity. His successor is MR. ALAN HODGSON who has been assistant general manager for nine years.

DR. C. J. DADSWELL, managing director of the English Steel Castings Corporation and the English Steel Springs Corporation, subsidiaries of English Steel Corporation, Limited, Sheffield, has been elected to the council of the Institution of Mechanical Engineers. Dr. Dadswell is a director of English Steel Corporation.

MR. WALTER HACKETT, 81-year-old chairman of the Oldbury firm of Accles & Pollock, Limited, completed 60 years as a member of the Amalgamated Engineering Union on March 28. To mark his long membership he will address his own Oldbury branch on "Changes that Have Taken Place in the Industry During the Last 60 Years."

WING COMMANDER J. M. AITON, chairman and managing director of Aiton & Company, Limited, pipework engineers, of Derby, will leave England this month on a business trip to South Africa and Australia. During his journey he will start a new subsidiary company in Australia, and also inspect a factory now under construction in South Africa.

Mr. J. E. SMITH has been appointed deputy-managing director of the North Eastern Marine Engineering Company (1938), Limited, as from May 1, resigning at that time from the board of Richardsons Westgarth (Hartlepool), Limited, where Mr. R. E. MATE succeeds him as the general works manager and a director. Both companies are members of the Richardsons Westgarth group.

Mr. W. B. H. GALLWEY has been elected chairman of British Acheson Electrodes, Limited, Sheffield, as from April 1. He succeeds Sir ARTHUR MATTHEWS, who is relinquishing his appointment as chairman. The major shareholding in British Acheson Electrodes belongs to Union Carbide and Carbon Corporation of New York, the other shareholders comprising six English steel-making companies.

Consequent upon the taking over of the die-casting section of Renfrew Foundries, Limited, by High Duty Alloys, Limited, and the sale of the sand-foundry mechanization plant, MR. A. EYDEN, A.M.I.MECH.E., has ended his connection with Almin, Limited, for whom he has managed Renfrew Foundries for the last 10 years, and has resigned from the board of Renfrew. His new address is St. Colms, Duchal Road, Kilmacolm.

Armstrong Whitworth (Metal Industries), Limited, and Jarrow Metal Industries, Limited, announce that MR. R. H. PHILLIPS, secretary and chief accountant, has been appointed a full director of the two companies; MR. E. JARVIS becomes industrial accountant, and MR. J. LAMB head office accountant of the group. MR. C. PULLEN, sales director, is to assume complete charge of all commercial and sales activities and will be relieved of certain outside work by MR. T. A. BIRD, who has been appointed sales manager of rolls and MR. WALKINGTON of foundry and engineering products. MR. C. LUSHLEY, MR. J. J. HALL, are to continue as commercial managers of Armstrong Whitworth (Metal Industries), Limited, and Jarrow Metal Industries, Limited, respectively.

Rear-Admiral (E) I. G. MACLEAN has joined the Brush Group, Limited, as director of marine development. He will act as technical adviser to the group in regard to design and development of equipment for marine purposes. He recently resigned from the post of Deputy Engineer-in-Chief of the Fleet, which he had held since 1952. He is an expert in super pressures and temperatures. Mr. S. A. LANE has, on medical advice, relinquished his executive responsibilities with the Brush Group and has tendered his resignation as a director of the company. Mr. Lane's services will continue to be available to the company and its subsidiaries in a consultative capacity.

MR. FRED BAUGH, managing director of the Alexander Metal Company, Limited, Bilston, Staffs, has been elected president of the British Bronze & Brass Ingot Manufacturers' Association. Mr. Baugh has been a member of the Council for several years, and vice-president during the last two years. He was trained as a metallurgist at the Staffordshire County Technical College, and the Sunbeam Motor Company, Limited, Wolverhampton. He later held several technical appointments in the Midlands with John Harper & Company, Limited, C. & L. Hill, Limited, Willenhall, and the Carborundum Company, Limited, Manchester. In 1942 he formed the Alexander Metal Company, Limited, acting as chairman and managing director, relinquishing the former position when, in 1955, Thos. W. Ward, Limited, acquired a controlling interest.

Pig-iron and Steel Production

Statistical Summary of December Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table I summarizes activities during the past six months. Table II gives production of steel ingots and castings in December, and Table III, weekly average production of finished steel. Table IV gives the production of pig-iron and ferro-alloys in December, 1955, and furnaces in blast. (All figures weekly averages in thousands of tons.)

TABLE I.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	Price Index, 1938 = 100.			Iron-ore output.	Imptd. ore used.	Coke to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	I. & S.	Coal.	All comdts.						Imports.[1]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[2]
1953	260	350	323	304	207	237	215	188	17	339	262	962
1954	263	364	325	299	234	238	229	198	7	356	277	831
1955—June[3]	269	368	331	263	223	221	217	206	31	364	286	866
July ..	272	423	338	294	230	241	231	170	29	308	254	999
Aug.[3]	283	423	338	307	244	245	236	189	36	345	256	1,200
Sept. ..	284	424	338	333	247	251	246	224	37	398	329	1,224
Oct. ..	284	424	340	334	249	257	249	225	34	399	332	1,163
Nov.[3]	285	431	343	331	259	261	253	228	36	409	332	1,154
Dec. ..	285	434	344	313	268	261	250	208	35	382	—	1,183

TABLE II.—*Weekly Average Production of Steel Ingots and Castings in December*, 1955.

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derby, Leics., Notts., Northants and Essex ..	—	3.9	13.8 (basic)	2.0	0.1	18.8	1.0	19.8
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire	1.3	30.7	—	2.2	0.3	33.3	1.2	34.5
Yorkshire (excl. N.E. Coast and Sheffield) ..								
Lincolnshire	—	39.2	—	—	0.1	39.2	0.1	39.3
North-East Coast	0.4	78.5	—	1.2	0.5	78.8	1.8	80.6
Scotland	3.5.	43.5	—	2.5	0.5	47.6	2.4	50.0
Staffs., Shrops., Worcs. and Warwick ..	—	16.7	—	1.2	0.7	16.7	1.9	18.6
S. Wales and Monmouthshire	5.0	70.6	6.6 (basic)	1.0	0.1	82.6	0.7	83.3
Sheffield (incl. small quantities in Manchester) ..	8.1	30.4	—	10.4	0.4	47.4	1.9	49.3
North-West Coast	—	1.5	4.4 (acid)	0.5	0.1	6.4	0.1	6.5
Total	18.3	315.0	24.8	21.0	2.8	370.8	11.1	381.9
November, 1955[3]	20.9	333.8	27.0	23.7	3.2	396.3	12.3	408.6
December, 1954[3]	17 2	292.4	23.2	18.7	3.2	344.7	10 0	354.7

TABLE III.—*Production of New Non-alloy and Alloy Finished Steel*

Product.	1953.	1954.	1954.	1955.	
			Nov.	Oct.	Nov.[4]
Non-alloy steel:					
Ingots, blooms, billets and slabs[4]	4.7	5.1	5.8	5.3	5.4
Heavy rails ..	8.7	9.6	10.1	9.8	10.0
Sleepers, etc. ..	2.2	1.9	1.6	1.8	1.5
Plates, ⅛ in. thick and over ..	46.5	47.0	47.3	51.6	48.8
Other heavy prod.	43.9	45.8	47.7	52.7	50.7
Ferro-concrete rods, etc.	5.1	5.9	7.0	7.1	8.2
Wire rods and other rods ..	15.6	19.7	23.4	24.1	25.0
Light rolled prod.	44.2	41.2	47.3	51.8	51.0
Bright steel bars ..	6.7	6.3	7.6	8.4	8.3
Hot-rolled strip ..	18.8	21.7	25.1	26.4	25.6
Cold-rolled strip ..	5.2	7.0	8.2	9.1	8.9
Sheets, incl. coated	34.1	38.8	42.6	44.4	45.6
Tinplate, terne- and blackplate ..	14.9	16.8	16.8	16.7	18.5
Tubes and pipes ..	20.1	20.0	23.5	24.5	52.1
Tube, pipe fit'gs ..	0.3	0.4	0.5	0.5	0.5
Tyres, wheels and axles	4.4	4.7	5.0	5.1	5.2
Forgings (excl. drop forgings) ..	3.1	2.6	2.6	2.9	2.5
Steel castings ..	4.0	4.0	4.0	4.6	4.7
Tool and magnet steel	0.3	0.2	0.3	0.4	0.3
Total	282.8	298.7	326.4	347.2	345.8
Alloy steel	13.7	13.2	15.1	16.8	17.3
Total deliveries from U.K. prod.[5] ..	296.5	311.9	341.5	364.0	363.1
Add: Imported finished steel ..	6.8	5.0	6.5	24.5	22.0
	303.3	316.9	348.0	388.5	385.1
Deduct: Intra-industry conversion[6] ..	42.6	41.5	46.2	57.9	54.1
Total net deliveries of new material ..	260.7	275.4	301.8	330.6	331.0

TABLE IV.—*Production of Pig-iron and Ferro-alloys during December*, 1955

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derby, Leics., Notts, Northants and Essex	26	—	20.0	26.8	1.0	—	47.8
Lancs. (excl. N.W. Coast), Denbigh, Flints. and Cheshire ..	7	—	18.2	—	—	1.6	19.8
Yorkshire (incl. N.E. Coast and Sheffield) ..	—	—	—	—	—	—	—
Lincolnshire ..	10	—	35.6	—	—	—	35.6
North-East Coast	21	4.4	50.1	—	—	0.9	55.4
Scotland	9	0.1	15.7	2.4	—	—	18.2
Staffs., Shrops., Worcs. and Warwick ..	7	—	9.4	1.4	—	—	10.8
S. Wales and Monmouthshire	10	4.7	34.1	—	—	—	38.8
Sheffield ..	2	—	3.4	—	—	—	3.4
North-West Coast	9	19.0	—	0.2	—	1.1	20.3
Total ..	101	28.2	186.5	30.8	1.0	3.6	250.1
November, 1955[3]	100	29.3	190.2	29.3	0.8	3.0	252.6
December, 1954[3]	99	29.3	172.4	27.0	1.0	3.9	233.6

[1] Weekly average of calendar month.

[2] Stocks mainly ingots and semi-finished at the end of the years and months shown.

[3] Five weeks, all tables.

[4] Other than for conversion into any other form of finished steel listed.

[5] Includes finished steel produced in the U.K. from imported ingots and semi-finished steel.

[6] Material for conversion into other products also listed in this table.

Publications Received

DSIR Grant-aided Research Associations Selected Publications—A Guide for Librarians. Published by the Department of Scientific Industrial Research, 5-11, Regent Street, London, S.W.1.

The title of this 40-page pamphlet clearly indicates its contents, and perusal impresses one with the extreme variety of subjects covered.

Moulding Men; issued by F. H. Lloyd & Company, Limited, James Bridge Steel Works, Wednesbury, Staffs.

This 48-page brochure has been produced with the object of attracting apprentices. The reviewer was specially pleased with the clarity of the illustrations. The notes which tell the boys how to behave at their first interview are excellent as they imply that some discipline is part and parcel of an industrial career and youngsters cannot learn this lesson too early. The progressive system in vogue together with the extensive facilities for sports and recreation are well set out. The rewards for effort and diligence, such as six months in the United States, makes this an outstanding apprentice scheme.

Guide to Birmingham; issued as publication No. 125 by the City of Birmingham Information Department, the Council House, Birmingham, 3.

Within the scope of 48 pages, a mine of information about the city of Birmingham has been assembled. Its history, residential amenities, educational facilities, are given and a map of the city centre shows that despite a maze of one-way streets it is possible to leave Birmingham for other places. Later, civic management activities are detailed and thereafter is printed the information required by the casual visitor such as lists of hotels, restaurants, and amusements. It is an ideal handbook for presenting to people attending the Castle Bromwich section of the British Industries Fair.

Arc Welding of Aluminium. Published by the Aluminium Development Association (*Bulletin* No. 19), from 33, Grosvenor Street, London, W.1; price 2s. 6d.

This booklet covers the field of arc welding in a most comprehensive manner. It is obviously a collection of various users' experiences, but at the same time presents the various points of view in an unbiased manner. Complete data are given on all aspects of arc welding such as temperature, electrodes, voltages, etc., and the comparison between helium and argon as shielding gases is most interesting.

From the foundryman's point of view, this publication is of considerable help as it discusses the properties of aluminium in relation to the effect of welding. It deals thoroughly and separately on the welding of castings and has useful tables on average properties. Equipment is also well covered. The difficulties of all the main alloys are discussed, and precautions regarding preheating, stress relieving and the welding of heat-treatable alloys are usefully set out. Possible faults are mentioned and full details of subsequent examination necessary to confirm that a first-class weld has been obtained are quoted. It is difficult to think of anything this *Bulletin* has left out, and it should prove of considerable help to anybody wishing to weld aluminium.

BCIRA Journal of Research and Development, Vol. 6, No. 3. Published by the British Cast Iron Research Association, Alvechurch, Birmingham.

This issue contains a long report on the "Wear of Cast-iron Machine-tool Slides, Shears and Guideways," by Dr. H. T. Angus, Mr. D. Marles and Mr. M. H. Hillman. The authors have found it difficult to draw many conclusive factors from their extensive tests. There are two points which do stand out and they are that a very soft matrix will cause scoring through particles becoming embedded, and that a high-phosphorus content does act as an insurance against failure in service.

The second report is on the "Application of Activity-sampling Technique in Iron Foundries." This is only a sort of *hors d'œuvres*, but it is obvious that the methods described give a better picture of general operating conditions in a foundry than do stop-watch tests on the individual. Stanley Matthews may play a brilliant game and his "fans" may have no eyes for anybody else, yet the impartial observer may quickly notice how the whole team could do better, by, say, tightening up the half-back line. This is a most important report and executives reading it will, at least temporarily, lose that myopia which only too often attacks them when they have been too close for too long a time in contact with their plant.

Book Reviews

Electric Motors and Controls. Published by the British Electrical Development Association, 2, Savoy Hill, London, W.C.2; price 9s. post free.

There is a tendency in industry to greater interest in the plant which is peculiar to the section using it, to the neglect of that which is common to all. The case of the electric motor is a typical instance, and when he was in industry the reviewer would have welcomed the possession of this book as in those days electric motors were temperamental and tests for starting torque were more a subject of argument than a conclusive result. Here is an authoritative textbook written in good simple English and well illustrated. It is one that can be universally recommended and moreover the price is reasonable.

Kempe's Engineers' Yearbook, 1956. (61st edition.) Edited by C. E. Prockter, under the direction of B. W. Pendred, and published in two volumes in a case by Morgan Brothers (Publishers), Limited, 28, Essex Street, Strand, London, W.C.2; price 75s. plus 2s. 1d. (home postage).

As the reviewer has pointed out when reviewing the 59th and 60th edition of this encyclopædic work, it responds well to the enquiring mind. Re-reading the opening paragraph on foundry practice, the writer cordially disliked it as there seemed to be an implication that one only uses castings if forgings and stampings fail to meet the case. Of course this impression was dispelled on a general examination of the text, particularly for example in the consideration of crankshafts. If all the sections are as good as those devoted to foundry practice, cast iron, cast steel and other subjects familiar to readers—and there is no reason to think otherwise—then the books indeed reach a high standard of reliability and usefulness. For the new edition, the time should be ripe to include the CO_2 Process.

V. C. F.

News in Brief

THE TELEPHONE NUMBER of Megator Pumps & Compressors, Limited, London, W.1, is now GROsvenor 6946.

THE FIFTH SCOTTISH CONFERENCE of the British Institute of Management is to be held at Gleneagles from April 20 to 22.

WITH A CAPITAL of £1,000,000, A.E.I.-John Thompson Nuclear Energy Company, Limited, has been formed as a private company.

THE INSTITUTE OF METALS has acquired new premises at 17, Belgrave Square, London, S.W.1, and will remove from 4, Grosvenor Gardens in the near future.

THE Federation of Light Metal Smelters announces that as from April 3 the maximum selling prices are as follow:—LM1, £206 per ton; LM2, £208; LM4 £210; LM6, £216.

PLATERS & STAMPERS, LIMITED, Prestige House, 14-18, Holborn, London, E.C.1, announce that from April 19 the name of the company will be changed to the Prestige Group, Limited.

CAWOOD WHARTON & COMPANY, LIMITED, announce that with effect from April 2 the address of their head office will be "Southlands," Ripon Road, Harrogate, Yorks. (Telephone: Harrogate 6868.)

THE FIRST turbo-alternator set for a new hydro-electric project at Silvon, in Asturias, North Spain, is to be built by the English Electric Company, Limited, for Electra de Viesgo S.A., Santander.

THE MASTER CUTLER, Mr. R. P. Phillips, and his guests will visit the River Don and Grimesthorpe works of the English Steel Corporation, Limited, on April 17, the day after the Cutlers' Feast.

AN ORDER worth more than £3,000,000 has been placed by Rhodesian Railways with Beyer, Peacock & Company, Limited, for 45 large Garratt steam locomotives. Delivery is due to begin early next year.

CROFTS (ENGINEERS), LIMITED, announce the opening of two new branch offices at 47/49, Derngate Chambers, Northampton ('phone: Northampton 3560), and Room 4A, Majestic Chambers, Campbell Place, Stoke-on-Trent.

A NEW FACTORY has been opened by the Plessey Company, Limited, Ilford (Essex), at Havant (Hants), where a new type of rotary switch is in production and where all the company's switch production will eventually be transferred.

THE Duke of Gloucester and the Duke of Northumberland were received by Mr. F. W. Gardner, a director and general manager of C. A. Parsons & Company, Limited, when they visited the company's Heaton Works on February 23.

THE FREEHOLD of the Union Ironworks, Ardwick, Manchester, has been acquired by Ferranti, Limited, electrical engineers, of Hollinwood (Lancs), from Brooks & Doxey, Limited, an associate company of Textile Machinery Makers, Limited.

A £2,000,000 APPEAL to British industry by University College, London, for help in providing a new engineering building has been launched by Lord Strang, chairman of the appeal committee, and Lord Chandos, chairman of Associated Electrical Industries, Limited.

IT IS CLAIMED that a merger of the Chatwood Safe & Engineering Company, Limited, Shrewsbury, and Milners Safe Company, Limited, London, E.C.1, creates the world's largest bankers' engineering undertaking. The new company will be known as Chatwood-Milner, Limited.

THE Vice-Chancellor of Cambridge University has announced that the British Titan Products Company, Limited, titanium pigment manufacturers, of York, has offered to support for three years from October 1 next, a studentship for research in inorganic chemistry under the direction of Prof. H. J. Emeléus.

THE FIRST bulk ore-carrier to be built on the Wear was launched on February 27 by Sir James Laing & Sons, Limited. Named the Atomena, the vessel is of 19,000 tons d.w., and is being built to the order of the Dingwall Shipping Company. Limited, of Canada (Nordstrom & Thulin & Scandinavian Ore Tankers, Inc.).

THE APPOINTMENT is announced of the Selson Machine Tool Company, Limited, and George Cohen Sons & Company, Limited—both members of the "600" group of companies—as joint sole distributors in the United Kingdom of Zeiss mechanical fine measuring tools, which are being offered for the first time since 1939.

SIMPLIFICATION and standardization of methods and components is to be the theme of a one-day conference which the Birmingham Productivity Association is holding on April 18. Mr. A. B. Waring, chairman of Joseph Lucas, Limited, will open the proceedings and Mr. H. A. R. Binney, director of the British Standards Institute, will be among those who are to address the meeting.

AT THE DAVID BROWN TRACTOR WORKS, Meltham, near Huddersfield, where certain sections are at present working a four-day week, the management have announced that a sales campaign in Sweden had brought in orders for 500 tractors, thus depleting the company's current stocks. It was also stated that it was hoped that other sales projects would make it possible in the near future to reconsider the production schedule.

Sir HAROLD WEST, managing director of Newton Chambers & Company, Limited, engineers, Thorncliffe Works, Chapeltown, entertained, on March 30, over 20 engineering apprentices of the firm who are doing national service. He has done this together with fellow directors for a number of Easters, and told the men this year, "It is my last occasion to honour you in my capacity as managing director." Sir Harold will retire in May.

TRIBUTES to the loyalty of employees of Sterling Metals, Limited, of Nuneaton, were paid at a presentation of long-service awards last month. Two employees who had each completed 45 years' service with the company were among those to receive long-service certificates and gold watches. Twenty-two other employees were each presented with awards in recognition of 25 years' service. Mr. Edward Player, managing director, made the presentations.

MEMBERS of the Northern section of the Institute of Vitreous Enamellers have been invited to visit the foundry and enamelling department of Morrison, Ingram & Company, Limited, Cornbrook, Manchester, 16, during the afternoon of April 16. The foundry is not mechanized but the visitors will see the carbon-dioxide process for core-making, ignition drying of moulds, the dot-weld process, and dry-process enamelling. Light refreshments will be provided by the firm.

News in Brief

THE Fraser & Chalmers Engineering Works of the General Electric Company, Limited, has received an order through its Australian associate, British General Electric Company (Pty.), Limited, for an ore-handling and preparation plant for the Australian Iron & Steel Company, Limited. This plant, which is for installation at Port Kembla Steelworks, New South Wales, will handle iron ore ranging in size from 4-in. cube to dust, at the rate of 800 tons per hour. Sinter conveying equipment is also included.

SHEFFIELD expects to house some 2,000 visitors for the annual meeting of the British Association for the Advancement of Science to be held in the city from August 29 to September 5. The local committee, of which Mr. John Heys, town clerk of Sheffield, and Dr. A. W. Chapman, registrar of Sheffield University, are honorary secretaries, made preliminary arrangements at a meeting on February 10, at which Mr. M. G. Bennett, general treasurer of the association, and Sir George Allen, secretary, were present.

A PROPOSAL by the Amalgamated Engineering Union for merging 20 unions in the engineering industry was discussed by leaders of the unions concerned in London recently. No formal decision was taken, as the subject will have to be discussed by the executive committees of the individual unions and in some cases by their annual conferences. Another joint meeting of their leaders is to be held later in the year. The AEU originally asked 31 unions to discuss amalgamation, but only 20 accepted, although six agreed to send observers.

THE STANDARDS DEPARTMENT of the Board of Trade has, with effect from April 3, reverted to its former title of "Standard Weights and Measures Department." The Standard Weights and Measures Department is responsible for the central administration of the Weights and Measures Acts and Regulations; and the Board considers the change of title desirable to prevent confusion between the functions of that department and those of the British Standards Institution, which is concerned with the general standardization of industrial products.

ACCORDING to a statement by the British Internal Combustion Engine Manufacturers' Association, the value of direct exports of internal combustion engines and parts, including a small percentage of stationary petrol engines, totalled £26,461,107 in 1955, an overall increase of 12 per cent. on the previous year. Figures available for 1956 showed that the upward trend was continuing, direct exports of engines and parts for January being valued at £3,122,401, against £2,638,256 for January, 1955. Sales of marine engines for January this year were the highest ever recorded.

A FACTORY for the manufacture of industrial and medical compressed gases is to be built by the British Oxygen Company, Limited, on a site which it has recently acquired at Raynesway, Derby, and a new works has been built by the firm on a six-acre site in the Milton of Craigie Area of Dundee. A 42-year lease of Spencer House, St. James's, London, S.W.1, has been taken by British Oxygen Gases, Limited, a subsidiary of the British Oxygen Company, Limited. The house, which was built in the middle of the eighteenth century for the first Earl Spencer, will be used for offices.

DAVY AND UNITED ENGINEERING COMPANY, LIMITED, Sheffield, have received an order worth £500,000 for rolling-mill equipment for Dorman Long (Steel), Limited, at their new Lackenby Works on the south bank of the River Tees. The equipment includes two cooling banks, with handling gear, for a new broad flange beam and heavy section mill which is being built in America for the Lackenby Works. A slabbing mill being built by Davy and United Engineering at Lackenby at a cost of just under a million pounds is said to be the largest mill of its type yet put into service in this country.

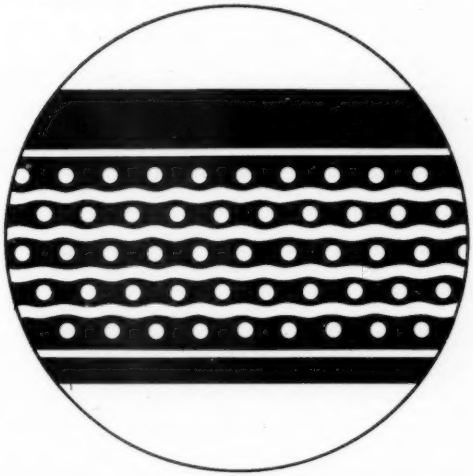
THE Keighley textile machinery manufacturing firm of Prince-Smith and Stells, Limited, recently staged at the Glusburn works of John C. Horsfall & Sons, Limited, worsted spinners, a demonstration of the Raper Autoleveller in its application to the crossbred section of the wool textile industry. It is claimed that the new unit can produce up to 9,000 lb. of 20-dram roving in a 45-hour week, with only three operatives, compared with up to six operatives on the conventional Bradford system, and that rovings for spinning hand-knitting wools in counts 3/12s., 3/10s. can be done in three operations as against five on conventional machinery.

THE RESEARCH LABORATORIES of the General Electric Company, Limited, have now developed miniature barium-titanate accelerometers and strain-gauges which, it is claimed, are already proving extremely useful in the field of vibration testing. They are new devices, the first of their kind to be made available on a large scale in this country, and it is said they have many advantages over older methods of vibration detection and measurement. They are inexpensive, reliable and simple to operate, and their very small size enables them to be used in a variety of circumstances where it would be impossible to accommodate more bulky equipment. In addition they are extremely sensitive and will work efficiently over a relatively wide range of temperatures and vibration frequencies.

THE CONTRIBUTION being made by aluminium in the field of atomic-energy developments is outlined in the annual report of James Booth & Company, Limited, the Birmingham metal firm. Over 36,000 ft. of special extruded section have been supplied by the company to the Australian National University Research School of Physical Science at Canberra, for the windings of the electro-magnet of the cyclotron constructed in Australia, and a further three-and-a-half miles of aluminium section have been supplied for Britain's largest medical cyclotron at Hammersmith Hospital. The coil in the 34-ton water-cooled magnetic coil of the cyclotron built by Metropolitan-Vickers for Liverpool University contains five miles of aluminium hollow conductor extruded by James Booth Company in continuous 2,000-ft. lengths.

FUNCTIONS in the calendar of the European Federation of Chemical Engineering for the years 1956-58 include the 31st annual congress of the DECHMA (Deutsche Gesellschaft für Chemisches Apparatewesen) at Frankfurt am Main, June 7 to 8; the annual meeting of process engineers at Hamburg, October 1 to 3, and a symposium on special themes in connection with the Chemical Engineering Convention to be held in Paris from November 22 to December 3. For the spring of 1957, the Koninkyk Instituut van Ingenieurs (Royal Society of Engineers) and Koninkyk Nederland Chemische Vereniging (Royal Dutch Chemical Society) are organizing a symposium, and in the autumn of the same year a joint congress (details of which are not yet known) is to be held in Zurich. The second congress of the European Federation of Chemical Engineering is scheduled to take place in Brussels from May 31 to June 8, 1958.

Focus on conveyor belting proves Goodyear superiority



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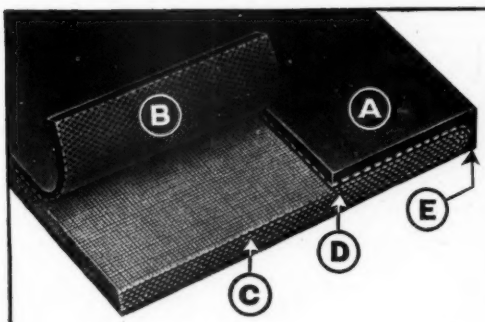

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An Appreciation of F. W. Stokes

Dr. J. E. Hurst has sent the following appreciation of the work of the late Mr. F. W. Stokes:—

The death of Francis William Stokes, B.SC., A.M.I.C.E., of Mansfield, late managing director of Sheepbridge Stokes Centrifugal Castings Company, Limited, and chairman of Stokes Castings, Limited, Mansfield, marks the loss of a pioneer in the development of the centrifugal-casting process, the application of which has now become an important section of the foundry industry.

Forty years ago, during the first world war, he not only invented the centrifugal-casting process as it is known to-day for the production of cylinder-liner castings, but established the very first successful production unit in the world. First established in Mansfield as Stokes Castings, Limited, later in conjunction with the then Sheepbridge Coal & Iron Company, Limited, he established the Sheepbridge Stokes Centrifugal Castings Company, Limited, Chesterfield, an organization which became the principal supplier of drum castings for the piston-ring manufacturing industry. The activities of this company expanded rapidly with the development of the production of cylinder liners for internal-combustion engines and particularly the development of the so-called dry liner and its use in the system of reboring internal-combustion-engine cylinders. Subsequently, "wet" liners became of equal importance. This pioneering work facilitated the application and development of alloy cast irons to cylinder-liner production. Hardened cast irons alloyed with nickel and chromium, cast irons heat-treated by hardening and tempering, austenitic cast irons, alloy irons suitable for nitrogen hardening, and finally, chrome-hardened liners were all pioneered by this company under his guidance. The extensive development in the application of the centrifugal casting process which has taken place over this period in the steel founding and non-ferrous founding sections of the industry all stem from this pioneer work of the late F. W. Stokes. Its application to the steel-castings industry is exemplified by the production of aero-engine cylinder sleeves in alloy steel in substitution for forgings, which led to the establishment of Sheepbridge Alloy Castings, Limited, at Sutton-in-Ashfield.

As a very accomplished engineer, foundryman and inventor, Mr. Stokes' abilities were not confined to casting; his interest was attracted to powder metallurgical processes and amongst the great achievements in the organizations established by him was the production of porous-metal de-icing strip inserts by Sintered Products, Limited, during the war. No obituary notice would be complete without reference to his achievements in the field of literature, under the pen name of Francis Everton, as a writer of outstanding and delightful detective novels.

Death of Mr. William Rennie

Mr. William Rennie, J.P., who died suddenly on February 17, at the age of 70, had been chairman and managing director of Federated Foundries, Limited, Glasgow, since the group was formed in 1935. He started his business career 56 years ago at the Kepoch Iron Works of David King & Sons, Limited, of which his uncle, the late Bailie John King, was the principal, and which is now a subsidiary of Federated Foundries. He was primarily responsible for the formation of the federated group.

Mr. Rennie was a member of the Committee of the Scottish Council (development and industry) and the Council of Industrial Design: he had been a member of the British Iron Founders' Association for over 25 years and was a member of the National Light Casting Iron Founders' Federation, a body founded by his uncle, which deals primarily with labour relations in the industry. He was a vice-president of the British Coal Utilisation Research Association, a former chairman of Dunbartonshire Unionist Association, and had recently been appointed an honorary manager of Falkirk Trustee Savings Bank.

Obituary

The death has occurred of Mr. DOUGLAS ARTHUR BOYD, a director of J. & T. Boyd, Limited, textile engineers and ironfounders, of Glasgow.

MR. JAMES M. BRUCE, owner of the J. M. Bruce Foundry Company at Cedar Grove, Wisconsin, USA, has died in hospitial there at the age of 72. He went to America at the age of 21 to settle in New York and founded the J. M. Bruce Foundry Company at Cedar Grove in 1919. He was a member of the American Foundrymen's Association for 50 years.

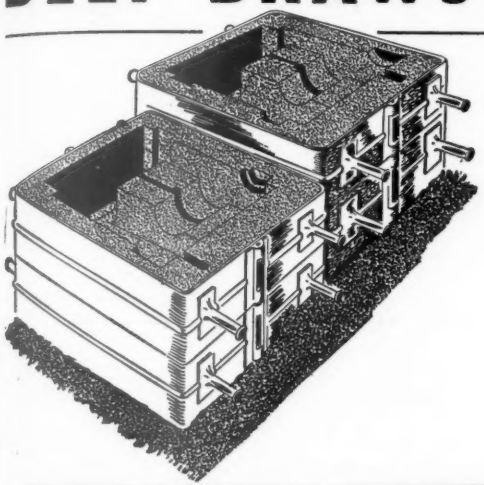
MR. W. H. BUTLER, founder and chairman of W. H. Butler & Sons, Limited, brass and iron founders, Lea Road Foundry, Dronfield, has died at the age of 81. Mr. Butler was also associated with the foundry business of W. H. Butler & Sons (Malleable), Limited, Callywhite Lane, Dronfield, and the Butler Manufacturing & Engineering Company, Limited, Church Street, Dronfield.

Mr. RICHARD ELSDON, who died in February, was on the staff of the Iron and Steel Institute for more than 47 years and served as librarian from 1908 until his retirement in December, 1951. When, in 1937, the libraries of the Institute of Metals and the Iron and Steel Institute were amalgamated, Mr. Elsdon was appointed librarian of the joint library. He introduced several developments including the loan of volumes to members, the compilation of bibliographies, and the commencement and expansion of the information department. Mr. Elsdon was elected an honorary member of the Iron and Steel Institute in 1952.

THE DEATH has been announced of Sir (ERNEST) MONTAGUE HUGHMAN on March 23, at the age of 79 years. Sir Montague Hughman, who was knighted in 1922, was a director of W. T. Henley's Telegraph Works Company, Limited, from 1924 until 1955, and chairman from 1933 until 1953, being succeeded as chairman by Sir John Dalton. He was one of the founders of the Institution of Engineers (India) in 1918-19, and was also the honorary secretary of the Indian section of the Institution of Electrical Engineers from 1912 until 1921, when he left that country. Recently he founded the trust bearing his name, for the relief of necessitous persons.

The death of Mr. JOHN MCNEIL occurred suddenly in Bombay on February 21. Born in 1899, and educated at the Rothesay Academy and the Royal Technical College, Glasgow, Mr. McNeil joined the Development and Research Department of the Mond Nickel Company in 1927. From 1940 until 1944 he acted as the company's technical representative in Sydney, Australia, and in 1944 became manager of their technical office in Bombay. Mr. McNeil was elected a Fellow of the Institution of Metallurgists in 1949 and was a member of many metallurgical organizations, to which he presented numerous technical papers.

DEEP DRAWS . . .



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Raw Material Markets

Iron and Steel

Production of high-duty castings by the engineering and speciality foundries is at a high level. Extensions of delivery schedules for castings for the motor-vehicle trade have removed some of the pressure on the foundries, but this appears to be the only effect. Outputs are generally maintained, except perhaps at those foundries directly connected with the industry, and other trades which are catered for by the engineering foundries have benefited by receiving increased supplies against outstanding orders, many of which were badly in arrear.

While the supply of pig-iron is on an improved scale, the low-phosphorus and medium-phosphorus pig-irons, which are in the main preferred by the engineering foundries, only just satisfy current needs and many users would like to have larger quantities than are at present forthcoming, so as to avoid the present hand-to-mouth existence. New customers find it very difficult, if not impossible, to obtain a supply of low-phosphorus iron to enable them to fulfil orders which require this grade, and this is a handicap to foundries which have found it necessary to take on fresh business owing to the shortage of orders for their normal work.

Hematite outputs have shown some improvement recently, but some producers are still heavily committed and are behind with many orders. Refined irons are in good supply and makers are able to accept additional business.

Most of the jobbing foundries are busy, but some of the light foundries are in need of work. While the demand for light castings has improved, present bookings are not heavy, but there is some prospect of this trade becoming more active. There are at present ample supplies of high-phosphorus pig-iron, but the prior claims of the steelworks for basic pig-iron and a reduction in output due to a furnace being blown out for relining in the near future are likely to interfere with future supplies.

The foundries are accepting all arisings of heavy cast-iron and machinery scrap. Foundry coke is being received in sufficient quantities for current consumption needs.

Non-ferrous Metals

The sluggishness accompanying the holiday period has not yet been dissipated and activity on both the London and United States markets is slight. Price movements have generally been small and have indicated an easier trend. This can most probably be attributed to the "wait and see" attitude on the part of buyers and not to a definite lower trend which followed the high price levels of a few weeks ago; the market would seem to be sensitive at the moment to any movement in the producing countries.

Indeed, London copper at the beginning of the week firmed up on the news of a sudden strike at the Mufulira mine on the Rhodesian Copperbelt concerning the handing over of certain jobs to African workers which had previously been done by Europeans. The mine was virtually at a standstill when European workers walked out, but the stoppage was shortlived and work was resumed to enable negotiations to begin and market prices reflected an easier situation.

US copper markets are quiet. The situation regarding the price of copper and brass products is now a little clearer. The Chase Copper & Brass Company has raised copper prices by 1½ cents a pound, basing the advance on an indicated 47½ cents price for primary copper—a price quoted by the parent company, Kennecott Copper. Other fabricating companies, who buy copper from Custom smelters and higher-priced scrap, had raised their product prices by as much as 3 cents on a 49 cents primary basis. Latest reports indicate that more of these concerns are cutting back their prices by 1½ cents to toe the line with the Chase Copper & Brass 47½ cent basis.

The tin market on both sides of the Atlantic seems a little easier, but is generally featureless. Little can be expected in the way of a definite trend until the future of the Texas tin smelter is decided finally and is no longer surrounded by rumours to which the sensitive market has reacted so often. It seems probable that the smelter will be in operation until the end of January next year. The President has approved and sent to Congress a report from the Office of Defence Mobilization stating that it would be desirable to sell the plant to private industry by the end of June, but the complexity of the deal might call for an extension of the deadline to the new year.

Lead remains dull. Sudden spurts of activity in London have, however, left the price largely unaltered. Interest seems to be mostly vested in the hopes of an early improvement expected in market circles. Zinc, too, is still bound by the holiday lethargy and the market is very quiet.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* April 5, £396 to £397; April 6, £393 10s. to £394; April 9, £384 to £385; April 10, £392 to £393; April 11, £381 10s. to £382 10s.
Three Months: April 5, £391 10s. to £392; April 6, £390 10s. to £391; April 9, £380 to £381; April 10, £385 10s. to £386; April 11, £375 10s. to £376.

TIN, Standard—*Cash:* April 5, £768 to £769; April 6, £768 to £770; April 9, £765 to £766; April 10, £766 to £768; April 11, £769 to £770.
Three Months: April 5, £764 to £765; April 6, £765 10s. to £766; April 9, £760 to £761; April 10, £761 to £762; April 11, £762 to £763.

LEAD—*First half April:* April 5, £119 10s. to £119 15s.; April 6, £119 5s. to £119 10s.; April 9, £118 15s. to £119; April 10, £118 15s. to £119; April 11, £118 5s. to £118 10s.
First half July: April 5, £118 to £118 5s.; April 6, £118 5s. to £118 10s.; April 9, £117 10s. to £117 12s. 6d.; April 10, £117 15s. to £118; April 11, £117 7s. 6d. to £117 10s.

ZINC—*First half April:* April 5, £99 5s. to £99 10s.; April 6, £99 10s. to £99 15s.; April 9, £99 to £99 5s.; April 10, £99 5s. to £99 10s.; April 11, £99 to £99 5s.
First half July: April 5, £97 5s. to £97 10s.; April 6, £97 12s. 6d. to £97 15s.; April 9, £97 5s. to £97 10s.; April 10, £97 15s. to £98; April 11, £97 5s. to £97 10s.

Production Exhibition and Conference

The first Production Exhibition and Conference was held in 1954. This year, a second one is to be held in the Grand Hall at Olympia, from May 23 to 31. The Institution of Production Engineers believe in having titles to their conferences which awaken the interest of the man in the street. Recently it was "Automation," now "Investing in Success" is being used.

Under this heading there are to be a series of lectures covering the expected subjects: research; fuel economy; factory layout; and so forth. The exhibition will stress technical developments rather than trade opportunities—though the two are difficult to dissociate.